RECORD OF DECISION

for the

OTTAWA RADIATION AREAS FRONTAGE PROPERTY TO NPL-8 AND RESIDENTIAL AREAS INCLUDING NPL-11

LaSalle County, Ottawa, Illinois

Environmental Protection Agency
Region 5
Chicago, Illinois

{September 24, 2003}

RECORD OF DECISION

for the

OTTAWA RADIATION AREAS FRONTAGE PROPERTY TO NPL-8 AND RESIDENTIAL AREAS INCLUDING NPL-11

LaSalle County, Ottawa, Illinois

Environmental Protection Agency
Region 5
Chicago, Illinois

{September 2003}

Table of Contents

List of Figures
(Following Report)

List of Tables
(Following Report)

Appendices

PART 1: THE DECLARATION

1.1 Site Name and Location - Ottawa Radiation Areas: a remedy for the Frontage Property to NPL-8 and a presumed remedy for radium contaminated soil in residential areas including NPL-11, Ottawa, LaSalle County, Illinois Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number ILD980606750.

1.2 Statement of Basis and Purpose

1.2.1 This decision document presents the United States Environmental Protection Agency's (U.S. EPA's) Selected Remedies for the following Ottawa Radiation Areas: Frontage Property to NPL-8 and radium contaminated soil in residential areas including NPL-11, which are chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). These decisions are based on the U.S. EPA's Administrative Record.

1.2.2 U.S. EPA provided the State of Illinois with an opportunity to concur with the recommended remedies. Any future letter from the State of Illinois regarding concurrence on the selected remedies will be added to the Administrative Record.

1.3 Assessment of Site - The response actions selected in this Record of Decision (ROD) are necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment; and pollutants or contaminants from these sites, which may present an imminent and substantial endangerment to the public health or welfare.

1.4 Description of Selected Remedy

1.4.1 The major components of the selected remedial actions for the Frontage Property and radium contaminated soils in residential areas including NPL-11 are listed below:

Presumed Remedy for Radium Contaminated Soil in Residential Areas including NPL-11

- Excavate soil contaminated with radium-226 above 6.2 picoCuries per gram (pCi/g);
- Backfill excavated areas with clean material;
- Dispose of the excavated contaminated material at a licensed radioactive material or an off-site landfill in accordance with applicable federal and/or state

regulations;

- Collect perched groundwater (if necessary), treat and discharge to surface water or discharge to the City of Ottawa's wastewater treatment system; and
- Option of volume reduction - Process excavated soil to (a) separate out the contaminated portion; (b) reduce, to extent practical, the volume of contaminated soil to be disposed of off-site. This may be done using mechanical screening and/or Segmented Gate System if that system is determined to be effective for the volume of soil to be excavated.

U.S. EPA will prepare a technical memorandum to make the determination as to whether a residential land use area meets the 6.2 pCi/g radium criteria and "plugs" into the ROD for implementation of the presumed remedy at the site. The technical memorandum will include a focused investigation and evaluation of the extent of contamination, risk assessment, land use, and evaluation of volume reduction. Public comment will be obtained on the technical memorandum.

Frontage Property to NPL-8

- Excavate soil contaminated with radium-226 above 6.2 pCi/g to depth of 10 feet;
- Backfill excavated areas with clean material;
- Dispose of the excavated contaminated material at a licensed radioactive material or an off-site landfill in accordance with applicable federal and/or state regulations;
- Collect perched groundwater, treat and discharge to the surface water or discharge to the City of Ottawa's wastewater treatment system; and
- Option of volume reduction - Process excavated soil to (a) separate out the contaminated portion; (b) reduce, to extent practical, the volume of contaminated soil to be disposed of off-site. This may be done using mechanical screening and/or Segmented Gate System if that system is determined to be effective for the volume of soil to be excavated.

1.4.2 The "presumed remedy" allows U.S. EPA to presume that excavation of soil in residential areas is appropriate where data indicates that soil contains radium in excess of 6.2 pCi/g radium. U.S. EPA has determined that a "presumed remedy" approach will greatly enhance the efficiency and effectiveness of the cleanup process. This approach will allow similar, but separate, residential areas to make use of the same remedy at different times. The remedy is almost identical to the selected remedy in the September 2000 Record of Decision for other residential areas in the Ottawa Radiation Area Site.

1.4.3 There are no non-aqueous phase liquid (NAPLs) at these two sites and as a result principal threat waste was not considered.

1.5 Statutory Determinations

1.5.1 The selected remedies attain the mandates of CERCLA Section 121 and to the extent practicable, the NCP. Specifically, the remedies are protective of human health and the environment, comply with federal and state requirements that are applicable or relevant and appropriate requirements to the remedial action, and are cost effective. These remedies utilize permanent solutions to the maximum extent possible.

1.5.2 These remedies do not satisfy the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment). U.S. EPA has determined that radium-226 contamination does not meet characteristics of materials requiring treatment as described in OSWER Directive 9380.2-06FS entitled "A Guide to Principal Threat and Low Level Threat Wastes." Therefore, options utilizing a combination of off-site disposal and institutional controls were selected.

1.5.3 Because the remedy selected for the Frontage Property will result in hazardous substances remaining on the site at levels preventing unlimited exposure and unrestricted use after the remedial action has taken place, the five-year review requirement applies to the action.

1.6 ROD Data Certification Checklist - The following information is in the *Decision Summary* section of this ROD. Additional information can be found in the Administrative Record file for this site.

1.6.1 Chemicals of concern (COCs) and their respective concentrations - Page 14

1.6.2 Baseline risk represented by the COCs - Page 13

1.6.3 Cleanup levels established for the COCs and the basis for these levels - Page 14

1.6.4 How source materials constituting principal threats are addressed - Page 24

1.6.5 Current and reasonable anticipated future land use assumptions used in the baseline risk assessment and ROD - Page 13

1.6.6 Potential land and groundwater use that will be available at the site as a result of the selected remedy - Page 13

1.6.7 Estimated capital, annual operation, maintenance (O&M) and total present worth costs discount rate, and the number of years over which the remedy cost estimates are projected - Page 20

1.6.8 Key factor(s) that led to selecting the remedy (i.e., describe how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision) - Page 25

1.7 Authorizing Signature

Wm. E. Muno

William E. Muno, Director
Superfund Division

9/24/03

Date

PART 2: THE DECISION SUMMARY

2.1 Site Name, Location and Description

2.1.1 The Ottawa Radiation Areas Site is located within and just outside the city limits of Ottawa, LaSalle County, Illinois (Figures 2-1). This ROD addresses a presumed remedial action to be applied to any radium contaminated soil in residential areas, including NPL-11, located within the City of Ottawa. The ROD also applies to the Frontage Property of NPL-8 located within the Ottawa Radiation Areas Site.

NPL-11 is located on the northeast side of the City of Ottawa, LaSalle County, Illinois. The site consists of a residential lot (Figure 2-2) bordered by Bellevue Avenue to the north, Goose Creek to the south, and residences to the east and west. The house west of the residential lot is also considered part of NPL-11.

The Frontage Property to NPL-8 is an approximately four-acre site located 1/4 mile east of the City of Ottawa, LaSalle County, Illinois (Figure 2-3). The property is bordered by State Route 71 (SR 81) on the southeast, a car dealership on the southwest, NPL-8 (landfill) on the north and west, and water filled clay pits on the northeast.

2.1.2 The CERCLIS Identification Number is ILD980606750.

2.1.3 The lead agency is the United States Environmental Protection Agency (U.S. EPA).

2.1.4 The expected source of cleanup monies will be the U.S. EPA.

2.2 Site History and Enforcement Activities

2.2.1 The Ottawa Radiation Sites became contaminated as a result of activities associated with two radium dial painting companies: the Radium Dial Company, which operated in the City of Ottawa from 1920 through 1932 and the Luminous Processes, Inc. (LPI), which operated in the City of Ottawa from 1932 to 1978. The source of contamination was radium sulfate paint that Radium Dial and LPI used in their dial painting operations. During the course of operations, the companies' equipment, material, buildings, and surrounding work areas became contaminated with radium-226, the major isotope of radium sulfate. Waste from these companies was likely disposed of at NPL-8 and may have been used as fill material within the community. Debris from the demolition of the Radium Dial facility, which occurred in 1968, was probably also buried at one or more locations in the area. The Illinois Department of Nuclear Safety (IDNS) demolished the LPI building in 1985, and contaminated debris from this demolition was disposed of at a licensed radioactive disposal facility.

2.2.2 The U.S. EPA and the State of Illinois discovered 14 areas in and around the City of Ottawa with radioactive contamination and subsequently targeted them for cleanup. On July 29, 1991, U.S. EPA added the Ottawa Radiation Areas, including NPL-8 and NPL-11 to the National Priorities List (NPL).

2.2.3 Of the 14 areas, U.S. EPA prioritized residential properties and properties near residential areas because they posed a greater imminent and substantial endangerment to the public. Between 1993 and 1997, U.S. EPA conducted removal activities on 12 of the 14 sites. As part of the removal action, U.S. EPA excavated contaminated soil above 6.2 picoCuries per gram (pCi/g) radium in these residential areas, including parts of NPL-11. U.S. EPA removed a total of 4,176 tons of radium-contaminated soil at NPL-11 in 1996. The NPL-11 excavation was terminated due to the difficulties of excavating material located below groundwater.

2.2.4 NPL-1, 4, 8, and 9 were designated for cleanup under the Superfund remedial program. U.S. EPA initiated the Remedial Investigation (RI), risk assessment, and Feasibility Study (FS) for NPL-8, including the landfill and the Frontage Property, in 1996 and published an RI and FS report in June 1999. U.S. EPA signed a Record of Decision (ROD) for NPL-1, 4, 8, 9, and Illinois Power on September 8, 2000. On September 11, 2002, U.S. EPA initiated the Remedial Design for NPL-1, 4, 8, 9, and Illinois Power.

2.2.5 In June 2000, U.S. EPA initiated an additional investigation, risk, and engineering evaluation/cost analyses (EE/CA) for NPL-11. U.S. EPA published the EE/CA for NPL-11 in May 2003. NPL-11 is owned by a residential homeowner.

2.2.6 The Frontage property was originally considered part of NPL-8 and is discussed in the September 2000 ROD. U.S. EPA recently separated the Frontage Property from NPL-8 (landfill) when additional contamination was discovered during an investigation in the Fall 2002. Based on the results from this investigation, U.S. EPA conducted a risk assessment and evaluated the Frontage Property in the Generic FS and Site-specific Technical Memorandum FS entitled "Technical Memorandum FS Supplement for NPL-8 Frontage Property. The Frontage Property is owned by a private party.

2.3 Community Participation

2.3.1 U.S. EPA established an information repository at the Reddick Library, 1010 Canal Street, Ottawa, Illinois. A copy of the Administrative Record for the site is maintained at the library.

2.3.2 U.S. EPA issued the Proposed Plan for the presumed remedy for radium contaminated soils in residential areas of the City of Ottawa, NPL-11 and the Frontage Property to NPL-8 on July 16, 2003. The public comment period for the Proposed Plan was

established from July 18, 2003 to August 18, 2003. U.S. EPA held a public meeting on July 30, 2003.

2.3.3 U.S. EPA has met the public participation requirements of Sections 113(k)(2)(B) and 117 of CERCLA, 42 U.S.C. §§ 9613(k)(2)(B) and 9617 for the remedy selection process for the presumed remedy for residential areas, NPL-11 and the Frontage Property to NPL- 8. This decision document presents the selected remedies for radium contaminated soils in residential areas of the City of Ottawa, NPL-11 and the Frontage Property to NPL-8. These remedies have been chosen in accordance with CERCLA, as amended by SARA, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decisions for these sites are based on the Administrative Record.

2.4 Scope and Role of the Operable Unit or Response Action This ROD addresses the presumed remedy for radium contaminated soils in residential areas, NPL-11 and the Frontage Property to NPL-8. The decision relies on the indications that radioactive soil above 6.2 pCi/g radium may pose risks to potential future residential and commercial/industrial users at these sites.

2.4.1 *Residential Areas including NPL-11:* Radium-contaminated soil in residential areas will be cleaned up using the presumed remedy approach. U.S. EPA has determined that excavation and off-site disposal of radium-contaminated soil above 6.2 pCi/g radium is necessary to protect residential uses in the City of Ottawa. U.S. EPA has determined that a "presumed remedy" approach to administer the residential radiation sites will greatly enhance the efficiency and effectiveness of the cleanup process. This approach will allow similar, but separate, residential areas to make use of the same remedy at different times. The presumed remedy is almost identical to the remedy for other residential areas in the Ottawa Radiation Areas Site. The remedy provides for the option of using the volume reduction technologies, such as, mechanical screening and/or the Segmented Gate System (SGS) depending on the evaluation in the technical memorandum. NPL-11 is located within a residential area and will be cleaned up using the "presumed remedy." Volume reduction technologies will not be used at NPL-11 due to the small volume of material.

2.4.2 *Frontage Property to NPL-8*: U.S. EPA has determined that excavation of radium-contaminated soil above 6.2 pCi/g radium to a depth of 10 feet and off-site disposal is necessary for the protection of human health and the environment. Because hazardous substances will remain at the Frontage Property, U.S. EPA will conduct a five-year review in accordance with Section 121 of CERCLA to assess whether the remedial action remains protective of human health and the environment.

2.5 Site Characteristics

2.5.1 *Conceptual Site Model:*
NPL-11: The Conceptual Site Model (CSM) for risk assessment and response action was based on residential, trespasser/visitor, and construction worker receptors exposure by ingestion of soil, inhalation of radionuclide particulate from soil, direct contact with soil, and inhalation of indoor and outdoor radon gas from soil. An ecological risk assessment was not conducted for this site due to its small size, its lack of habitat, and its highly-developed locale.

Frontage Property to NPL-8: The Conceptual Site Model (CSM) for risk assessment and response action was based on residential, trespasser, recreational, commercial/industrial, and construction receptors exposure by ingestion of soil, inhalation of radionuclide particulate from soil, direct contact with soil, and inhalation of indoor and outdoor radon gas from soil. U.S. EPA assessed the risks to wildlife and plants for exposure by ingestion of radium-contaminated soils or dust particles, inhalation of radium or radon daughters in dust particles, and direct whole body exposure from gamma radiation. See Figure 2-4 for the Receptor and Community Feeding Relationships Model.

2.5.2 *Overview of Ottawa Area:* The City of Ottawa lies in the Illinois Valley. Regionally, the geology of the Ottawa area is primarily composed of bottomland or Wisconsinan glacial deposits, overlying Pennsylvanian or Ordovician-aged bedrock. The glacial deposits vary from 10 to 100 feet thick in the area. Most of the area is underlain by the Ordovician-aged St. Peter Sandstone, which varies in thickness between 150 to 175 feet. Below the St. Peter Sandstone are shales and sandstone of the Cambrian System, including 160 to 200-foot thick Galesville Sandstone.

The regional aquifer in the area is the St. Peter Sandstone. Regional transmissivities of greater than 20,000 gallons per day foot have been reported and vary according to localized thickness at the St. Peter Sandstone. However, the City of Ottawa currently supplies city residents with municipal water from four-large volume wells screened in the Galesville Sandstone between 1,180 to 1,220 feet below ground surface (bgs). The residents in the NPL-11 area are supplied with municipal water. Higher groundwater flow rates have been reported for the Galesville than for the St. Peter. No indication of a confining layer exists between the two aquifers. There are some residents who live outside the city limits that use private drinking water wells in the St. Peter Sandstone. These private drinking water wells were sampled as part of the remedial investigation for NPL-8.

The concentration of radium in Ottawa's groundwater is historically high due to elevated levels of naturally-occurring radium in both the Galesville and St. Peter Sandstone aquifers. The City of Ottawa drinking water supply has historically been 6.2 picoCuries in a liter (pCi/L) of water. This concentration exceeds U.S. EPA's drinking water

standard of 5.0 pCi/L. Ottawa received a variance from restricted status from the Illinois Environmental Protection Agency (Illinois EPA) in 1986. In 2002, the City of Ottawa installed a reverse osmosis system in its water treatment plant. As a result, the radium concentration has dropped to between 2.0 and 3.0 pCi/L. The water supply now meets the drinking water standard for radium.

LaSalle County and the City of Ottawa lie in the drainage basin of the Illinois River, the master stream of this region. The Illinois River flows across the county in a westward direction. The important tributaries in this area are the Vermillion, Little Vermillion, and the Fox Rivers.

The Ottawa area is located in the Grand Prairie Section of the Grand Prairie Natural Division of Illinois. The Grand Prairie Division is a vast plain formerly occupied by tall-grass prairie. Forest bordered the rivers and there are occasional groves on moraines and glacial hills.

Approximately 21,325 people live within a 3-mile radius of the City of Ottawa. Approximately 15 percent of the population is rural and 85 percent is urban. Major industries in the Ottawa area include manufacturing and agriculture. Other industries include retail, health care, and mining.

2.5.3 *Overview of NPL-11:*

2.5.3.1 *Geology:* Four distinct strata were identified underlying the site: clean fill material comprises the uppermost layer; a white stone material underlies the clean fill in some areas; underlying the clean fill and white stone is a natural sediment unit consisting of silts and sands; and the final layer is St. Peter Sandstone.

The clean fill layer is continuous across the entire site at a depth of 3 to 7 feet below ground surface (bgs). The white stone material is 1 to 2 feet thick and is present between 4 to 9 feet bgs. This material was placed at the site during the excavation activities in 1996 to provide traction for earth-moving equipment. Underlaying clean fill material throughout the site is a gray to black, organic rich layer of silt. This layer is the natural sediment layer. Trace organics could be found throughout this layer, along with some gravel. Trace quantities of historic fill composed of ash, cinder, and slag was also observed in the natural sediment layer. The natural sediment layer is very saturated. The St. Peter Sandstone was encountered at 16 feet bgs.

2.5.3.2 *Hydrology*: Except during periods of relatively high precipitation, overland flow on grassy areas of the site is expected to be minimal. The topography of this site is flat with the exception of a 6 to 8-foot drop off near Goose Creek. During periods of normal precipitation surface water will either collect in pools at the surface and be lost through evapotranspiration or infiltrate the fill layer. A surface

drain connected to a drainage system exists near the southern portion of the site. This drainage system channels pooled surface water into a drain tile, which discharges directly into Goose Creek.

2.5.3.3 *Hydrogeology*: A hydrogeological investigation was not conducted at the NPL-11 site, but groundwater is expected to either discharge into Goose Creek at the southern boundary of the site to be incorporated into the regional St. Peter Sandstone aquifer and eventually discharge into either the nearby Fox or Illinois Rivers.

2.5.3.4 *Ecology*: The NPL-11 site is located in a highly-developed location within the City of Ottawa. Due to the small size of the site, the lack of habitat, and the location within a developed area, no sensitive ecosystems have been identified.

2.5.3.5 *Contamination*: In June 2000, U.S. EPA performed an additional soil investigation of NPL-11. Soil samples were analyzed for radium-226, metals, pesticides, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). Radium-226 concentration exceeded the preliminary remediation goal (PRG) of 6.2 pCi/g in one of 24 soil samples. Radium-226 was detected above the PRG of 6.2 (pCi/g) in a single boring at a concentration of 19.5 pCi/g from the sediment layer at a depth of 6 to 8 feet bgs. The radium-226 contamination at the NPL-11 investigation area appears to exist primarily in the natural sediment layer, and is centralized near the center of the investigation area. The total approximate area of contamination is 500 square feet. The total volume of radium-226 contaminated soil is estimated to be 74 cubic yards (cy).

The three soil samples were collected and analyzed for metals, pesticides, PCBs, VOCs, and SVOCs were collected from the historical fill at depth of 6 to 8 feet bgs and 8 to10 feet bgs. Arsenic was detected in all three samples at concentrations ranging from 8.0 to 13.7 milligram/kilogram (mg/kg). Arsenic exceeded the PRG of 11.3 mg/kg in two samples at concentrations of 11.6 and 13.7 mg/kg. However, the average arsenic concentration of the three samples was 11.0 mg/kg and below the PRG. Iron was detected in one sample at a concentration of 23,300 mg/kg and it exceeded the PRG of 23,000 mg/kg. Although the iron concentration in this one sample exceeded the PRG, the average iron concentration of all three samples was below the PRG. Seven pesticides were detected in samples, however, the contaminant concentrations did not exceed their respective PRGs. PCBs and VOCs were not detected in any of the soil samples. SVOCs were detected in samples, but the concentrations did not exceed their respective PRGs.

2.5.4 *Overview of Frontage Property to NPL-8:*

2.5.4.1 *Geology:* There are three distinct strata at the site: fill material, a silty clay glacial till, and St. Peter Sandstone bedrock, which occasionally underlies a thin shale bedrock layer.

Areas of historical fill material are located throughout the property. The total volume of fill material is estimated as 21,150 cy. Fill material encountered at the site came from two sources: material resulting from previous landfilling activities and clay fill suspected to be used as cover during landfilling activities. To clarify discussions of these different fill types, fill from past landfilling activities is referred to as "historical fill." Clay fill that is suspected to be used as cover material is referred to as "clay fill."

Historical fill was found in the northeastern portion of the site. An aerial photo taken in 1939 shows a pond in the area where the majority of the deep historical fill was identified. The pond was probably drained and filled at some point during the landfilling activities. The historical fill consists primarily of glass slag, ash, cinder, brick, and general construction debris. Historical fill was as deep as 24 feet bgs. The depth of historical fill material was greatest near the northeast section of the property. The clay fill was typical clay to sandy clay loam soil. The clay fill contained some organic debris such as wood and decomposing vegetation and in areas also contained rocks, gravel, and shale fragments.

A consistent stratum of glacial tills and clays was encountered beneath the fill. In areas where the fill was less than 8 feet, a brownish–gray, mottled, silt, and Wisconsinan clay till was encountered. The upper portion of the silty clay till contained a weathered portion, characterized by ferric oxidation associated with fractured and ironstone concretions. Underlying the weathered zone was uniform, gray silty clay. This clay was stiff and dry and appeared to be acting as an aquitard for perched groundwater. Perched groundwater is defined as bodies of shallow groundwater that are trapped above clay lenses or other low permeability units that are discontinuous.

The St. Peter Sandstone bedrock was encountered at an elevation of approximately 458 feet mean sea level. The sandstone was gray in color, saturated, medium cemented, well sorted, well rounded, and fine- to medium-grained.

2.5.4.2 *Hydrology*: The site is approximately 2.8 miles northeast (upstream) from the confluence of the Fox and Illinois Rivers. According to a Federal Emergency Management Agency (FEMA) Flood Insurance Survey study, the surface of the Frontage Property is not situated in a flood plain. The study indicated that the flood stage elevations for the northeastern corporate limits of Ottawa for the 10,

50, 100 and 500 year floods were at elevations of 470.6 feet, 474 feet, 475 feet and 480 feet, respectively.

2.5.4.3 *Hydrogeology*: Perched groundwater is the result of precipitation percolating down through the historical fill and clay fill that eventually collected atop the native till and shale unit. Perched groundwater was observed at depths ranging from approximately 8 feet bgs. There is not a direct communication between the perched groundwater and St. Peter Sandstone or the Fox River.

The St. Peter Sandstone underlies the dry shale and clay aquitard. The flow direction in the St. Peter Sandstone is to the southwest. This direction of flow correlates with regional and local flow groundwater towards the Illinois River.

2.5.4.4 *Ecology*: The habitats on the site include open field and deciduous woods. Elm, black cherry, cottonwood, red oak, and white oak are common in the wooded areas along the site borders. An open field habitat is found in the center of the property, with species such as goldenrod, buckthorn, and various grasses present. Monocultures of common reed are present along the berms, in low laying areas, and in the drainage ditch along the east side of the site.

Signs of rabbits, squirrels, and deer have been observed on the property. Other potential receptors include various songbirds, small mammals, reptiles, and amphibian common to northwest Illinois. Sport fish in the Fox River include channel catfish, carp, muskellunge, and small mouth bass.

The portion of the Fox River near the site is classified as an Illinois Natural Area Inventory (INAI) site. From Morgan Creek to the confluence with the Illinois River, the Fox River is a medium-sized river. The substrate is bedrock overlain in some areas with boulders or mixtures of sand and gravel. Habitats present included: swift boulder/gravel riffles; smooth flowing runs; quiet sand-bottomed backwaters; and silt-bottomed pools. Depths range from six inches in some of the shallow riffles to four feet in the main channel. The state-threatened fish, *moxostoma carinatum* (river redhorse), was found to be a common inhabitant in this section of the Fox River during a 1991 survey.

The National Wetlands Inventory classified the Fox River as a lower perennial riverine system with an unconsolidated bottom that is permanently flooded. There are two small areas of palustrine emergent wetlands across the river from the site and scattered excavated ponds north and south of the site, and a small excavated lake at the corner of SR 71 and U.S. 6.

2.5.4.5 *Contamination*: U.S. EPA collected and analyzed 70 soil samples for radium-226 and radium-228. Results from soil samples indicated radium-226 concentration

ranging from 0.55 to 9,800 pCi/g. Fifteen samples had radium-226 above 6.2 pCi/g. The highest concentrations of radium-226 detected were 1,500 pCi/g (16 to 17 feet bgs), 1,100 (9 to 10 feet bgs), 190 pCi/g (23 to 24 feet bgs), and 9,800 pCi/g (4 to 5 feet bgs). Results from soil samples indicated radium-228 concentrations ranging from 0.39 to 2.0 pCi/g, which are consistent with background.

The radium-226 contamination is located in four distinct areas. One area is located near the entrance to the landfill, where the contamination extends to a depth of 4 feet bgs. The second area is located near the northern property boundary in the western-central portion of the site, where contamination extends to a depth of 7 feet bgs. The third is located in the center of the site and is where the majority of the radium contamination extends to a depth of 24 feet bgs, which corresponds with a body of water filled in sometime after 1939. The fourth area is located near the northern property boundary is the east-central portion of the site and contamination extends to a depth of 11 feet bgs. The estimated volume of radium-226 contaminated soil on the site is 5,760 cy.

2.6 Current and Potential Future Land and Resource Uses

2.6.1 *Residential Areas including NPL-11*: The NPL-11 site is located in the northeast portion of Ottawa. Residential properties constitute the primary land use in the vicinity of the site and it is expected to remain that way in the future.

2.6.2 *Frontage Property to NPL-8*: The Frontage Property formerly housed Midwest Landscaping, which is now defunct. The property has been used for commercial/ industrial purposes and no change in use is expected in the future.

The property has also been used as an access point to the adjacent property owned by the State of Illinois. The State of Illinois plans to develop a State Park on its property in the future.

The area to the east of the site is primarily commercial and light industrial. Numerous buildings including offices, sales, service facilities, and a day care are located in this area. A small number of light industrial facilities, such as a wood products manufacturer, are located south and east of the site. Agricultural and wooded areas constitute the primary land uses to the north of the site.

2.7 Summary of Site Risks U.S. EPA assessed the human health and ecological risks to evaluate the impact to human health and the environment if no remedial actions are taken at sites. Information and data collected during the investigations at each site served as the

foundations for the risk evaluations. These risks evaluations provide the basis for action and identify the contaminants and exposure pathways that the remedial action must address.

2.7.1 *NPL-11*: A baseline human health risk assessment was prepared to evaluate the potential human health impacts within the site. Data collected by the Illinois Department of Nuclear Safety served as the basis for this task.

2.7.1.1 *Summary of Human Health Risk Assessment*: Based on the current site conditions and site ownership, the baseline risk assessment evaluated trespasser, residents, and construction workers as the receptors groups at this site. The Risk Assessment examined two areas: Area A and Area B. The site consists of two residential lots that are located in a primarily residential area of Ottawa. Residential land use is considered a current and future land use of the site. The risks are summarized in Tables 2-1 and 2-2. The reasonable maximum exposure (RME) is the highest degree of exposure that is reasonably expected to occur at the site and the representative average exposure (RAE) is intended to represent the more typical exposure conditions. The same exposure concentration was used for both the RME and RAE scenarios.

Identification of Chemical of Concern (COC): Radium-226 is the COC.

Exposure Assessment: Potential exposure was estimated individually for an adolescent trespasser, an adult and child resident, and an adult construction worker. Exposure pathways included ingestion, dermal contact and inhalation. While different exposure assumptions were used for each receptor group, the same toxicity (i.e., slope factors reference dose) were applied to all population subgroups evaluated. See Tables 2-3 and 2-4.

Uncertainty: There are three primary areas in the risk assessment with significant levels of uncertainty, which could result in an over- or under-estimation of risk to human health. These three areas of uncertainty are: (1) the reliability of environmental data used to develop the risk assessment to express conditions at the site; (2) the use of standard exposure assumptions, which may or may not accurately reflect site conditions; and (3) methodology by which carcinogenic health criteria are developed to be used in toxicological assumptions. Most of the uncertainties are accounted for by making assumptions that tended to over-estimate risk.

2.7.1.2 *Ecological Risk Assessment*: An ecological risk assessment was not conducted for this site due to its small size, its lack of habitat, and its highly-developed locale.

2.7.2 *Frontage Property to NPL-8*: The Screening Level Risk Evaluation (SLRE) approach was used to assess the human health and ecological risks. This approach is numerically equivalent to conducting the "forward calculation" typically performed for a baseline

human health risk assessment if the exposure pathways and assumption used to derive the risk-based concentrations (RBCs) are the same as those used in the forward calculations.

2.7.2.1 *Baseline Human Health Risk Assessment*: Based on current conditions and ownership at the Frontage Property, U.S. EPA assessed risks for current users and potential future users (residential, trespasser, recreational, commercial/industrial, and construction). The risks are summarized in Tables 2-5 and 2-6.

Identification of Chemicals of Concern (COCs): Radium-226 is the COC.

Exposure Assessment: An exposure assessment typically involves a detailed analysis of potentially exposed human receptors, selection of appropriate intake assumptions, estimation of exposure point concentrations (EPCs), and estimation of chemical daily intakes. However, for the SLRE, many of these steps have already been incorporated into the RBCs and were therefore not performed as part of the SLRE. Exposure pathways included ingestion, dermal contact, and inhalation. See Tables 2-7 and 2-8.

Uncertainty: A number of uncertainties are inherent in the estimation of potential cancer risks for this site. These uncertainties are generally associated with (1) the sampling strategy and site character process or (2) the assumption, models, and extrapolation that make up the risk assessment process. Primary uncertainties related to the SLRE include the RBCs used in the screening and the presence of background levels of radionuclides.

2.7.2.2 *Ecological Risk*: U.S. EPA assessed the risks to wildlife for the three exposure scenarios described above. U.S. EPA found no potential for adverse effects to terrestrial plants and animals from exposure from radium-226.

2.7.2.3 *Human Risk Associated with Residual Radium Contaminated Soil after the Excavation of Soil exceeding 6.2 pCi/g radium-226 to Depth of 10 Feet*: A Supplemental Radionuclide Risk Assessment (August 2003) using the RESRAD model was performed to supplement the Technical Memorandum FS Supplement for NPL-8 Frontage Property. The purpose of this Supplemental Technical Memorandum was to identify the human health risk associated with residual radium-226 contamination on the NPL-8 Frontage Property after Alternative 4b (Institutional Controls, Excavation of Soil exceeding 6.2 pCi/g radium-226 to Depth of 10 Feet, Perched Groundwater Collection, and Off-Site Disposal) was implemented. This data can also be used for Alternative 5b (Institutional Controls, Excavation of Soil exceeding 6.2 pCi/g radium-226 to Depth of 10 Feet, Perched Groundwater Collection, Volume Reduction, and Off-Site Disposal) because the only difference between 4b and 5b is the volume reduction.

The future proposed usage of NPL-8 Frontage Property is commercial and industrial. This scenario assumes that a slab on grade building will likely be placed atop the contaminated soil remaining 10 feet below a clean soil cover. Using this information

health risk models were prepared based on two scenarios that take place on or near the covered contaminated area. One scenario is based on a worker spending 100% of his/her time outside and the other scenario is based on a worker spending 50% of his/her time inside and 25% of his/her time outside. RESRAD was used to estimate radon exhalation from radium-contaminated soil, the amount of radon released, the radon concentrations in indoor air that result from this flux, the airborne concentration of radon decay products, and the external penetrating radiation.

The risk assessment estimates for the outdoor scenario indicate that the radon risk is negligible due to the dissipation of radon gas to the atmosphere. The cancer risk associated with external radiological exposure is below the acceptable risk standards, therefore, no further protection is required for outdoor exposure.

For the indoor/outdoor scenario, the total cancer risk for the indoor radon inhalation was reduced due to the 10-foot clean soil cover after implementation of Alternative 4b. The total baseline radiological cancer risk from the Screening Level Risk Assessment Report is $1.5x10^{-2}$. Following the implementation of Alternative 4b, the estimated total radiological cancer risk estimate decreases to $1.1x10^{-3}$, which is approximately 14 times lower than the risk from the original baseline estimate. However, the residual radiological cancer risk still exceeds the acceptable risk range of 10^{-6} to 10^{-4} in the indoor/outdoor scenario. Therefore, engineering measures such as a radon-reduction system would be needed in order to divert radon gas before it enters the building. The results are summarized in Table 2-9.

2.8 Remedial Action Objectives The Remedial Action Objectives (RAOs) for the Frontage Property to NPL-8 and residential areas including NPL-11 are:

2.8.1 *Residential Areas including NPL-11:*

2.8.1.1 *For Human Health:*

- Prevent ingestion and inhalation of soil having radionuclide COCs.
- Prevent external exposure to soil having radionuclide COCs.

2.8.1.2 *For the Environment:*

- Prevent lateral migration of contaminated surface soil to surface water and sediment via surface water runoff.
- Prevent downward migration of COCs in soil to perched groundwater and groundwater via percolation.
- Prevent exposure of wildlife to COCs in the soil.

2.8.2 *Frontage Property to NPL-8:*

2.8.2.1 *For Human Health:*

- Prevent ingestion and inhalation of soil having radionuclide COCs.

- Prevent external exposure to soil having radionuclide COCs.
- Prevent inhalation of radon gas from soil having radionuclide COCs.

2.8.2.2 *For the Environment:*

- Prevent lateral migration of contaminated surface soil to surface water and sediment via surface water runoff.
- Prevent downward migration of COCs in soil to perched groundwater and groundwater via percolation.
- Prevent exposure of wildlife to COCs in the soil.

2.9 Description of Alternatives

2.9.1 *Residential Areas including NPL-11:*
Alternative 1a - No Action

Alternative 2a - Excavation of Soil exceeding 6.2 pCi/g radium-226, Perched Groundwater Collection, and Off-Site Disposal

Alternative 3a - Excavation of Soil exceeding 6.2 pCi/g radium-226, Perched Groundwater Collection, Volume Reduction, and Off-Site Disposal

Description of Remedy Component:
Alternative 1a - No Action. This alternative is required by CERCLA to be carried forward to the detailed analysis phase in order to provide a baseline comparison with the other alternatives. The No Action alternative implies that no remedial action would be undertaken at the site. Therefore, the potential human health and environmental risks associated with exposure to COCs would not be mitigated and would most likely increase as site conditions deteriorate in the future.

Alternative 2a - Excavation of Soil exceeding 6.2 pCi/g radium-226, Perched Groundwater Collection, and Off-Site Disposal. Soil with radium-226 concentrations exceeding 6.2 pCi/g would be excavated and staged. The excavated soil would include overburden soil and historical fill. Perched groundwater would be collected, if any is encountered, during excavation and staging activities. The perched groundwater would be treated using filtration and discharged to a nearby surface water body (if available) or discharged to the City of Ottawa waste water treatment plant. Soil exhibiting a radium-226 level of 6.2 pCi/g or greater will be disposed of off-site at a licensed radioactive waste landfill. Soil exhibiting radium-226 levels of less than 6.2 pCi/g will be disposed of off-site at a licensed special waste landfill.

For future residential areas with soil contaminated by radium, a site-specific technical memorandum (focused RI) will be prepared, which will include the following

information: (1) extent of contamination; (2) risk assessment; (3) land use; and (4) evaluation of volume reduction. The technical memorandum will make the determination as to whether a site meets the 6.2 pCi/g radium-226 and residential land use criteria and thereby "plugs into" the ROD for implementation of the presumed remedy at the residential area.

Alternative 3a - Excavation of Soil exceeding 6.2 pCi/g radium-226, Perched Groundwater Collection, Volume Reduction, and Off-Site Disposal. Soil with radium-226 concentrations exceeding 6.2 pCi/g would be excavated and staged. Perched groundwater would be collected, if any is encountered, during excavation and staging activities. The perched groundwater would be treated using filtration and discharged to a nearby surface water body (if available) or discharged to the City of Ottawa waste water treatment plant. Soil that would require disposal at a radioactive landfill would undergo volume reduction using mechanical screening and/or the segmented gate system (SGS). Soil exhibiting a radium-226 level of 6.2 pCi/g or greater would be disposed of off-site at a licensed radioactive waste landfill. Soil exhibiting radium-226 levels of less than 6.2 pCi/g would be disposed of off-site at of at a licensed special waste landfill.

For future residential areas with soil contaminated by radium, a site-specific technical memorandum (focused RI) will be prepared, which will include the following information: (1) extent of contamination; (2) risk assessment; (3) land use; and (4) evaluation of volume reduction. The technical memorandum will make the determination as to whether a site meets the 6.2 pCi/g radium-226 and residential land use criteria and thereby "plugs into" the ROD for implementation of the presumed remedy at the residential area.

This alternative was not evaluated for NPL-11 because the estimated volume of contaminated soil (74 cubic yards) was too small for consideration.

Technical Memorandum: For either Alternative 2a and Alternative 3a, a technical memorandum would need to be prepared for future residential areas with soil contaminated by radium. The technical memorandum would include the following information: (1) extent of contamination; (2) risk assessment; (3) land use; and (4) evaluation of volume reduction. The technical memorandum would make the determination as to whether a site meets the 6.2 pCi/g radium-226 and residential land use criteria and thereby "plugs into" the ROD for implementation of the presumed remedy at the residential area.

2.9.2 *Frontage Property to NPL-8:*
Alternative 1b - No Action

Alternative 2b - Excavation of Soil exceeding 6.2 pCi/g radium-226, Perched Groundwater Collection, and Off-Site Disposal

Alternative 3b - Excavation of Soil exceeding 6.2 pCi/g radium-226, Perched Groundwater Collection, Volume Reduction, and Off-Site Disposal

Alternative 4b - Institutional Controls, Excavation of Soil exceeding 6.2 pCi/g radium-226 to Depth of 10 Feet, Perched Groundwater Collection, and Off-Site Disposal

Alternative 5b - Institutional Controls, Excavation of Soil exceeding 6.2 pCi/g radium-226 to Depth of 10 Feet, Perched Groundwater Collection, Volume Reduction, and Off-Site Disposal

Description of Remedy Component:
Alternative 1b - No Action. This alternative is required by CERCLA to be carried forward to the detailed analysis phase in order to provide a baseline comparison with the other alternatives. The No Action alternative implies that no remedial action would be undertaken at the site. Therefore, the potential human health and environmental risks associated with exposure to COCs would not be mitigated and would most likely increase as site conditions deteriorate in the future.

Alternative 2b - Excavation of Soil exceeding 6.2 pCi/g radium-226, Perched Groundwater Collection, and Off-Site Disposal. Soil with radium-226 concentrations exceeding 6.2 pCi/g would be excavated and staged. Perched groundwater would be collected, if any is encountered, during excavation and staging activities. The perched groundwater would be treated using filtration and discharged to a nearby surface water body (if available) or discharged to the City of Ottawa waste water treatment plant. Soil exhibiting a radium-226 level of 6.2 pCi/g or greater will be disposed of off-site at a licensed radioactive waste landfill. Soil exhibiting radium-226 levels of less than 6.2 pCi/g will be disposed of off-site at a licensed special waste landfill.

Alternative 3b - Excavation of Soil exceeding 6.2 pCi/g radium-226, Perched Groundwater Collection, Volume Reduction, and Off-Site Disposal. Soil with radium-226 concentrations exceeding 6.2 pCi/g would be excavated and staged. Perched groundwater would be collected, if any is encountered, during excavation and staging activities. The perched groundwater would be treated using filtration and discharged to a nearby surface water body (if available) or discharged to the City of Ottawa waste water treatment plant. Soil that would require disposal at a radioactive landfill would undergo volume reduction using mechanical screening and/or the SGS. Soil exhibiting a radium-226 level of 6.2 pCi/g or greater would be disposed of off-site at a licensed radioactive waste landfill. Soil exhibiting radium-226 levels of less than 6.2 pCi/g would be disposed of off-site at of at a licensed special waste landfill.

Alternative 4b - Institutional Controls, Excavation of Soil exceeding 6.2 pCi/g radium-226 to Depth of 10 Feet, Perched Groundwater Collection, and Off-Site Disposal. The land use after implementation would be restricted to commercial/industrial use only and

only slab on grade structures with the radon gas systems would be allowed. Disturbance of the 10-foot soil cover would be prohibited. Soil with radium-226 concentrations exceeding 6.2 pCi/g would be excavated to a depth of 10 feet. Perched groundwater would be collected, if any is encountered, during excavation and staging activities. The perched groundwater would be treated using filtration and discharged to a nearby surface water body (if available) or discharged to the City of Ottawa waste water treatment plant. Soil exhibiting a radium-226 level of 6.2 pCi/g or greater would be disposed of off-site at a licensed radioactive waste landfill. Soil exhibiting radium-226 levels of less than 6.2 pCi/g would be disposed of off-site at a licensed special waste landfill.

Alternative 5b - Institutional Controls, Excavation of Soil exceeding 6.2 pCi/g radium-226 to Depth of 10 Feet, Perched Groundwater Collection, Volume Reduction, and Off-Site Disposal. The land use after implementation would be restricted to commercial/ industrial use only and only slab on grade structures with radon gas systems would be allowed. Disturbance of the 10-foot soil cover would be prohibited. Soil with radium-226 concentrations exceeding 6.2 pCi/g would be excavated to a depth of 10 feet. Perched groundwater would be collected, if any is encountered, during excavation and staging activities. The perched groundwater would be treated using filtration and discharged to a nearby surface water body (if available) or discharged to the City of Ottawa waste water treatment plant. Soil that would require disposal at a radioactive landfill would undergo volume reduction using mechanical screening and/or the SGS. Soil exhibiting a radium-226 level of 6.2 pCi/g or greater would be disposed of off-site at a licensed radioactive waste landfill. Soil exhibiting radium-226 levels of less than 6.2 pCi/g would be disposed of off-site at a licensed special waste landfill.

2.10 Summary of Comparative Analysis of Remedy Alternatives In accordance with the NCP, the alternatives were evaluated by the US. EPA using nine criteria. For an alternative to be an acceptable remedy it must pass the U.S. EPA's two threshold criteria 1) Overall Protective of Human Health and the Environment and 2) Compliance with ARARs. See Tables 2-10 and 2-11 for the Summary of Detailed Analysis of Remedial Alternatives.

2.10.1 *Residential Areas including NPL-11:*

2.10.1.1 *Overall Protection of Human Health and the Environment* - Alternative 1a is not protective of human health and the environment. Alternatives 2a and 3a are equally protective of human health and the environment. Alternatives 2a and 3a involve removal of all soil with radium-226 concentration exceeding 6.2 pCi/g from the site. The removal of contaminated soil will eliminate the vertical and lateral migration of COCs.

2.10.1.2 *Compliance with Applicable, Relevant and Appropriate Requirements (ARARs)* - Except for Alternative 1a, all alternatives meet the ARARs. A more detailed analysis can be found in the Generic FS and EE/CA. The ARARs for Alternative 2a are discussed in

more detail in Section 2.13.2 and Table 2-17 of the ROD.

2.10.1.3 *Long-Term Effectiveness* - Alternative 1a does not offer long-term effectiveness because no remedial action is implemented. Alternatives 2a and 3a offer the most long-term effectiveness because all the contaminated material is removed from the site and there is no uncertainty of future exposure risks associated with it. Alternatives 2a and 3a also allow unrestricted land use at the site.

2.10.1.4 *Reduction of Toxicity, Mobility or Volume though Treatment* - Treatment is not a principal element of any of the alternatives. Alternative 1a does not reduce toxicity, mobility, and volume of the radium-226 in any medium though treatment. Alternatives 2a and 3a incorporate treatment of perched groundwater via filtration thereby reducing the volume of COCs. None of the alternatives reduces the toxicity, mobility, and volume of the COCs in the soil through treatment.

2.10.1.5 *Short-Term Effectiveness* - The short-term effectiveness of Alternative 2a is equal to Alternative 3a because they are essentially the same alternative, except for the volume reduction.

2.10.1.6 *Implementability* - Alternative 1a does not involve implementing any remedial measures, and therefore would be easy to implement. Alternatives 2a and 3a are both moderately difficult to construct and operate. The SGS component of Alternative 3a makes Alternative 3a slightly more difficult to construct and operate than Alternative 2a. For Alternatives 2a and 3a, excavation could be difficult because of the depth of the excavation and the need to manage water.

Alternatives 2a and 3a are the best selection in terms of ease of additional remediation and ability to monitor because all the contaminated material would be removed and would not require additional remediation or monitoring.

Alternatives 2a and 3a are essentially the same in terms of availability of services and material as these are readily available. Alternative 3a is slightly more difficult to implement because the SGS is used.

2.10.1.7 *Cost* - No cost comparison can be done for the residential areas in general due to the lack of site-specific information. The site-specific Technical Memorandum will compare the cost estimates for Alternative 2a and Alternative 3a. In general Alternative 3a is more cost effective for large volumes of material and Alternative 2a is more cost effective for smaller volumes. Alternative 3a is not cost effective for NPL-11 due to the comparatively small volume of material.

For NPL-11, Alternative 1a has no associated cost as compared to the total present worth cost of $200,000 for Alternative 2a. Alternative 2a has no associated annual O & M cost.

The detailed cost estimates can be found in Table 2-12.

2.10.1.8 *State Acceptance* - The U.S. EPA provided the State of Illinois with an opportunity to concur with the recommended remedies. Any future letter from the State of Illinois regarding concurrence on the selected remedies will be added to the Administrative Record.

2.10.1.9 *Community Acceptance* - The community has indicated that it supports U.S. EPA's recommendations.

2.10.2 *Frontage Property to NPL-8*:

2.10.2.1 *Overall Protection of Human Health and the Environment* - Alternative 1b is not protective of human health and the environment. Alternatives 2b and 3b involve removal of all contaminated soil from the site. Due to the removal of contaminant soil, the potential for radium-226 to migrate vertically and laterally will be completely eliminated. Alternatives 4b and 5b are protective of human health, but percolation remains a concern. It is assumed that some percentage of precipitation will percolate into the contaminated soil. Under Alternatives 4b and 5b, excavation of the radium-226 contaminated soil down to 10 feet will remove the risk attributable to ingestion of contaminated soil, inhalation of fugitive dust, and external exposure to the commercial/ industrial user or construction worker. Further protection is provided with land use restrictions prohibiting disturbances of the 10-foot soil cover. The RESRAD model was run to identify the residual human health risk associated with radon gas from residual radium-226 contamination below 10 feet after implementation of Alternatives 4b and 5b. The risk for the outdoor scenario is negligible after implementation of Alternatives 4b and 5b. The risk estimate for indoor radon inhalation in the indoor/outdoor scenario was not acceptable without radon reduction equipment on any building. Alternatives 4b and 5b address this risk by restricting land use to construction of only slab on grade buildings and requiring radon reduction equipment on any slab on grade buildings.

2.10.2.2 *Compliance with Applicable, Relevant and Appropriate Requirements (ARARs)*: Except for Alternative 1b, all alternatives meet the ARARs. Alternatives 2b and 3b meet the cleanup standard of 5 pCi/g of radium-226 above background identified in 40 C.F.R. 192.12(a). Alternatives 4b and 5b meet the supplemental standards under 40 C.F.R. 192.21 in lieu of the standards in 40 C.F.R. 192.12(a). Supplemental standards are appropriate for Alternatives 4b and 5b because the contaminated material below 10 feet bgs does not pose a clear present or future hazard. Alternatives 4b and 5b will result in reduction in risk over the baseline risk for the indoor inhalation of radon-222.

A more detailed analysis can be found in the Generic FS and Technical Memorandum FS Supplement. The ARARs for Alternative 4b are discussed in more detail in Section 2.13.2 and Table 2-17 of the ROD.

2.10.2.3 *Long-Term Effectiveness* - Alternative 1b does not offer long-term effectiveness. Alternatives 2b and 3b offer the most long-term effectiveness because all the contaminated material is removed from the site and there is no uncertainty of future exposure risks associated with it. Alternatives 2b and 3b also allow unrestricted land use at the site. Alternatives 4b and 5b offer long-term effectiveness in terms of soil exposure and gamma radiation, but do not offer long-term effectiveness in terms of radon-222 gas and infiltration. For Alternatives 4b and 5b, buildings with no basements would be allowed with appropriate institutional and engineering control for radon-222 gas.

2.10.2.4 *Reduction of Toxicity, Mobility or Volume though Treatment* - Treatment is not a principal element of any of the alternatives. Alternative 1b does not reduce toxicity, mobility, and volume of the radium-226 in any medium though treatment. Alternatives 2b, 3b, 4b, and 5b incorporate treatment of perched groundwater via filtration thereby reducing the volume of COCs. None of the alternatives reduces the toxicity, mobility, and volume of the COCs in the soil through treatment.

2.10.2.5 *Short-Term Effectiveness* - The short-term effectiveness of Alternative 2b is equal to Alternative 3b because they are essentially the same alternative, except for the volume reduction component of Alternative 3b. The short-term effectiveness of Alternative 4b is equal to Alternative 5b because they are essentially the same alternative, except for the volume reduction component of Alternative 5b. Alternatives 4b and 5b are more effective in the short-term because they require less time than Alternatives 2b and 3b to implement. Alternatives 4b and 5b also require the transportation of less contaminated soil to off-site landfills than Alternatives 2b and 3b. Workers and members of the community could be exposed during the excavation and transportation of contaminated soil. Therefore, Alternatives 4b and 5b are more effective in the short-term than Alternatives 2b and 3b.

2.10.2.6 *Implementability* - Alternative 1b does not involve implementing any remedial measures, and therefore would be easy to implement. Alternatives 2b, 3b, 4b, and 5b are all moderately difficult to construct and operate. Alternatives 3b and 5b are slightly more difficult to construct and operate than Alternatives 2b and 4b, respectively, because of the SGS. For Alternatives 2b, 3b, 4b, and 5b, excavation could be difficult because of the depth of the excavation and the need to manage water. Alternatives 2b and 3b would be more difficult than Alternatives 4b and 5b.

Alternatives 2b and 3b are the best selection in terms of ease of additional remediation and ability to monitor because all the contaminated material would be removed and would not require additional remediation or monitoring.

Alternatives 2b, 3b, 4b, and 5b are essentially the same in terms of availability of services and material as these are readily available, although Alternatives 3b and 5b are slightly more difficult to implement than Alternatives 2b and 4b, respectively, because of the

SGS.

Thus, Alternatives 2b, 3b, 4b, and 5b are similar in terms of overall implementability.

2.10.2.7 *Cost* - There are no costs associated with the Alternative 1b (No Action Alternative). Other than Alternative1b, Alternative 4b has the lowest cost at a total present worth cost of $5,820,000. Alternative 4b is followed in ascending order, by Alternative 5b ($6,630,000); Alternative 2b ($9,100,000); and Alternative 3b ($10,650,000). The detailed cost estimates can be found in Tables 2-13, 2-14, 2-15, and 2-16.

2.10.2.8 *State Acceptance* - The U.S. EPA provided the State of Illinois with an opportunity to concur with the recommended remedies. Any future letter from the State of Illinois regarding concurrence on the selected remedies will be added to the Administrative Record.

2.10.2.9 *Community Acceptance* - The community has indicated that it supports U.S. EPA's recommendation.

2.11 Principal Threat Wastes The NCP established an expectation that U.S. EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). The principal threat concept is applied to the characterization of source material at a Superfund site. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile. U.S. EPA has determined that radium-226 at the Ottawa Radiation Areas is not a principal threat waste.

2.12 Selected Remedy Based on current information, U.S. EPA prefers the following Alternatives:

2.12.1 *Residential Areas including NPL-11*: Based on current information, U.S. EPA prefers Alternative 2a - Excavation of soil contaminated with radium-226 above 6.2 pCi/g, Backfill, Perched Groundwater Collection, and Off-Site Disposal as a presumed remedy for soil in residential areas. This remedy provides for the option of using volume reduction technology (Alternative 3a).

The presumed remedy is the action that will be taken for contaminated soil that exceeds 6.2 pCi/g radium-226 in residential areas. For future residential areas with soil contaminated by radium, a site-specific technical memorandum (focused RI) will be prepared, which will include the following information: (1) extent of contamination; (2) risk assessment; (3) land use; and (4) evaluation of volume reduction. The technical memorandum will make the determination as to whether a site meets the 6.2 pCi/g

radium-226 and residential land use criteria and thereby "plugs into" the ROD for implementation of the presumed remedy at the residential area. Public comment will be obtained on the technical memorandum. After plugging into the remedy, remedial design and remedial action can begin at residential areas based upon the U.S. EPA approved technical memorandum.

For NPL-11, U.S. EPA prefers Alternative 2a because of the small volume of soil that needs to be excavated. Alternative 3a is more cost effective when larger volumes soil are involved.

2.12.2 *Frontage Property to NPL-8:* Alternative 4b - Excavation to a Depth of 10 feet, Off-Site Disposal, Perched Groundwater Collection, and Institutional Controls with the option of using volume reduction (Alternative 5b). Volume reduction could be added if the treatability studies show that the SGS is effective and if the remedial action for the Frontage Property and landfill could be conducted at the same time.

2.12.3 *Summary of Rationale for the Selected Remedy*:
Residential Areas including NPL-11: U.S. EPA believes Alternative 2a meets the threshold criteria and provides the best balance of tradeoff among the alternatives. The U.S. EPA expects the preferred alternative to satisfy the following statutory requirements of CERCLA Section 121(b): (1) to be protective of human health and the environment; (2) to comply with ARARs; (3) to have long-term effectiveness and permanence; (4) to have short-term effectiveness; (5) to be implementable; and (6) to be cost effective.

This presumed remedy is virtually identical to other remedy decisions selected for radium-contaminated soil in residential areas in the City of Ottawa. This presumed remedy approach selects a remedy for similarly situated residential areas without the need to perform a separate remedy selection process. The presumed remedy approach allows remedial action to begin without redundant remedy selection processes. It also allows focused investigation to occur independent from other residential areas and to begin remedial action sooner.

Frontage Property: U.S. EPA believes Alternative 4b meets the threshold criteria and provides the best balance of tradeoff among the alternatives. The U.S. EPA expects the preferred alternative to satisfy the following statutory requirements of CERCLA Section 121(b): (1) to be protective of human health and the environment; (2) to comply with ARARs; (3) to have moderate long-term effectiveness and permanence; (4) to have short-term effectiveness; (5) to be implementable; and (6) to be cost effective.

2.12.4 *Description of the Selected Remedy*:
Residential Areas including NPL-11: The presumed remedy (Alternative 2a) consists of excavation, backfill, perched groundwater collection, and off-site disposal of soils at residential areas that "plug in" to the remedy. The process for determining whether a

residential area plugs into the remedy is incorporated as part of the remedy. Under this process, a site-specific technical memorandum (focused RI) will be prepared for a residential area with radium contamination in soils which will include: (1) extent of contamination; (2) risk assessment; (3) land use; and (4) evaluation of volume reduction. The technical memorandum will make the determination as to whether a site meets the criteria of 6.2 pCi/g radium-226 and residential land use and thereby "plugs into" the ROD for implementation of the presumed remedy at the residential area. Public comment will be obtained on the technical memorandum. After plugging into the remedy, remedial design and action can begin at residential areas based upon the U.S. EPA approved technical memorandum.

The first step of the presumed remedy is to clear and grub any existing vegetation and debris. The aboveground portion of trees and other vegetation present on the site would be cut, chipped, and disposed off-site at a licensed composting facility. The root system of trees and other vegetation would be removed, chipped, analyzed for disposal parameters, and managed accordingly. Miscellaneous debris encountered on the site would be removed and staged. Prior to disposal, the decontaminated debris would be screened for radioactivity levels.

Soil with radium-226 concentrations exceeding 6.2 pCi/g would be excavated from the entire site and temporarily staged in waste piles on a storage pad. It is assumed that the soil with radium-226 concentrations exceeding 6.2 pCi/g is intermingled with soil radium-226 concentrations less than 6.2 pCi/g. In order to access the radium-226 contaminated soil, some additional soil will require excavation. This additional soil could also include overburden material. The site-specific technical memorandum would specify the approximate volume of soil to be excavated. Soil would be excavated using conventional mechanical excavation equipment. Perched groundwater encountered during excavation activities would be pumped to the perch water treatment system. Confirmation samples would be collected from the excavation to verify that all soil with radium-226 concentrations exceeding 6.2 pCi/g has been removed. The excavations would then be backfilled with clean fill material from an off-site source.

The management of perched groundwater would require both collection and treatment. For future residential sites, the total quality of perched groundwater will be specified in the site-specific technical memorandum. The perched groundwater would be pumped from the excavation using suitable excavation dewatering techniques into temporary storage tanks. Water collected in the tanks would be filtered prior to being discharged to a nearby surface water body (if available) or discharged to the City of Ottawa wastewater treatment plant. Based on the anticipated perch groundwater quality data, filtration is assumed to be sufficient to meet discharge standards. The treated water must meet federal, state, and local standards to be discharged to a surface water body.

Soil with radium-226 concentrations greater than 6.2 pCi/g would be disposed of off-site

at a licensed radioactive waste landfill. Soil exhibiting radioactivity levels equal to or less than 6.2 pCi/g would be disposed of off-site at a licensed special waste landfill.

If volume reduction (Alternative 3a) is viable for future residential areas, soil that requires disposal at a radioactive landfill would undergo mechanical screening and/or the SGS. The site-specific technical memorandum will evaluate the feasibility of using volume reduction technology.

For NPL-11, historical fill material from one isolated area will be excavated. In order to access the 74 cy of soil, approximately 111 cy of overburden would require excavation. The excavated area would be backfilled to grade with approximately 74 cy of imported clean fill and 111 cy of excavated overburden. After backfilling, the excavation would be seeded to re-establish a vegetative cover. Approximately 98 cy of soil would be dewatered following excavation. Dewatering activities will consist of mixing the soil with a dewatering agent. The soil dewatering process could increase the volume of soil by 30 percent. Approximately 128 cy of soil contaminated with radium-226 would be transported off-site to a licensed radioactive waste landfill.

Frontage Property to NPL-8: Alternative 4b includes institutional controls, excavation of soil up to depth of 10 feet, perched groundwater collection, and off-site disposal. The institutional controls would consist of land use restrictions in the form of restrictive covenants and groundwater monitoring. Land use restrictions via restrictive covenants on the Frontage Property will be implemented to: (a) restrict future use of the property to commercial/industrial; (b) prohibit disturbance of the 10-foot soil cover; (c) require radon reduction system and monitoring on any buildings constructed on a portion of the property in the future; and (d) limit construction to only slab on grade buildings. It is estimated that six new monitoring wells would be used for monitoring the effectiveness of Alternative 4b. The new monitoring wells would be installed in the St. Peter Sandstone aquifer. The one existing monitoring well would be abandoned. The new monitoring wells will be sampled and analyzed annual for radium-226, radium-228, SVOCs, and metals.

Any existing vegetation and debris would be cleared and grubbed. Soil with radium-226 concentrations exceeding 6.2 pCi/g would be excavated up to a depth of 10 feet bgs and temporarily stored in waste piles. The Frontage Property soil with radium-226 concentrations exceeding 6.2 pCi/g is intermingled with soil that exhibits radium-226 concentrations less than 6.2 pCi/g. Therefore, additional soil would be excavated, including overburden material. Approximately 15,900 cy of soil will require excavation. Field screening and analytical sampling would be performed to distinguish between excavated materials with elevated level of radioactivity and overburden material. Field screening data during excavation would also be used to determine the approximate extent of the contamination. Confirmation sampling would be collected from the excavation to verify that all soil with radium-226 concentrations exceeding 6.2 pCi/g has been removed

to a depth of 10 feet.

The management of perched groundwater would require both collection and treatment. The total quantity of perched groundwater is estimated to be approximately 10,000 gallons. The perched groundwater would be pumped from the excavation using suitable dewatering techniques into temporary storage tanks. Water collected in the tanks would be filtered prior to being discharged to Fox River or discharged to the City of Ottawa wastewater treatment plant. The treated water must meet federal, state, and local standards to be discharged to the Fox River.

Soil with radium-226 concentrations greater than 6.2 pCi/g would be disposed of off-site at a licensed radioactive waste landfill. Soil exhibiting radioactivity levels of equal to or less than 6.2 pCi/g would be disposed of off-site at a licensed special waste landfill.

The excavated areas would be backfilled to grade with fill material from an off-site source and hydroseeded. If needed, engineered measures would be used to maintain drainage at the site.

Following the completion of the remedial action, the post-closure monitoring and maintenance period (O&M) would begin. The O&M activities would include annual groundwater and annual maintenance of the backfill layer to preserve its integrity as a cover.

Alternative 5b which includes volume reduction could be selected in the future, if the remedial action for the landfill portion of NPL-8 and the Frontage occur at the same time and if the treatability study for the SGS demonstrates that the technology is cost-effective. The increase in volume would influence the cost-effectiveness of the SGS.

2.12.5 *Cost Estimate for the Selected Remedy*:
Residential Areas including NPL-11: For future residential sites, the cost estimate for Alternative 2a is outlined in the 2003 Generic FS and the site-specific cost for a particular residential area will be provided in a technical memorandum.

For the NPL-11 site, the cost estimate was developed in the 2003 EE/CA. The total present worth of this potential alternative, including capital cost is $200,000. A detailed breakdown of the cost can be found in Table 2-12.

Frontage Property to NPL-8: The cost estimate for Alternative 4b was developed in the 2003 Generic FS and Technical Memorandum FS Supplement. The total present worth of this potential alternative, including capital cost and assuming 30 years of O&M at a discount rate of seven percent is estimated at $5,820,000. A detailed breakdown of the cost can be found in Tables 2-13, 2-14, 2-15, and 2-16.

2.12.6 *Estimated Outcomes of the Selected Remedy:*
Residential Areas including NPL-11: U.S. EPA believes that implementation of the selected remedy will return the site to unrestricted residential use by eliminating risk from exposure to soil contaminated with radium-226. These sites could be available for residential use immediately upon completion of the remedy.

Frontage Property to NPL-8: U.S. EPA believes that implementation of the selected remedy will return the site to a fairly unrestricted commercial/industrial use over the majority of the property. Residential use on the site would be prohibited. Only grade on slab buildings with radon reduction systems can be constructed where radium-226 is left in-place below 10 feet. The site could be available for commercial/industrial use immediately upon completion of the remedy.

2.13 Statutory Determinations Under CERCLA §121 and the NCP, 40 C.F.R. Part 300, U.S. EPA must select remedies that: protect human health and the environment; comply with applicable or relevant and appropriate requirements, unless a statutory waiver is justified; are cost-effective; and utilize permanent solutions and alternatives treatment technologies or resources recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element. CERCLA also has a bias against off-site disposal of untreated wastes. This section discusses how the selected remedies meet these statutory requirements.

2.13.1 *Protection of Human Health and the Environment*: U.S. EPA has determined that each of its selected remedies would provide adequate protection by reducing risk to U.S. EPA's acceptable risk range through removal or a combination of removal and containment. In the case of the remedy for residential areas including NPL-11, the selected remedy provides protection by reducing risk to future residential users through removal of soil contaminated with radium-226 above the cleanup level. For the Frontage Property, the selected remedy will provide protection by reducing risk to future commercial/industrial users through a combination of removal of soil contaminated with radium-226 above the cleanup level and containment of soil below 10 feet bgs. Implementation of the selected remedy for the Frontage Property will result in radioactive materials being left in-place at depth (10 feet bgs) on portions of the property. Land use restrictions via restrictive covenants on the Frontage Property will be implemented to: (a) restrict future use of the property to commercial/industrial; (b) prohibit disturbance of the 10-foot soil cover; (c) require radon reduction system and monitoring to any buildings constructed on a portion of the property in the future; and (d) limit construction to only slab on grade buildings. Additionally, for the Frontage Property, the implementation of Alternative 4b, removal of the radium-226 contaminated soil down to 10 feet, will remove the risk attributable to ingestion of contaminated soil, inhalation of fugitive dust, and external exposure to the commercial/industrial user or construction worker. The RESRAD model identified risk

from radon gas associated with radium-226 being left in-place below 10 feet, but Alternative 4b addresses this risk by restricting the land use.

2.13.2 *Compliance with Applicable, Relevant and Appropriate Requirements (ARARs):*
2.13.2.1 *Residential Areas:* The presumed remedy for radium contaminated soil in residential areas meets the ARARs set forth in Table 2-17. U.S. EPA established the cleanup level of 6.2 pCi/g for radium-226 in part on 40 C.F.R. Part 192, Standards for the Stabilization, Disposal, and Control of Uranium and Thorium Mill Tailings. The surface soil standard (5 pCi/g radium-226 above background) in 40 C.F.R. Part 192 is not applicable, but is a relevant and appropriate requirement at the site. The subsurface standard (15 pCi/g radium-226) in 40 C.F.R. Part 192 is not an ARAR.

The standards contained within Subpart B of 40 C.F.R. Part 192 are not applicable to the Ottawa Site because they are only applicable for Title I sites designated under Section 102(a)(1) of Uranium Mill Tailings Radiation Control Act of 1978 (42 U.S.C. 7918). The radioactive material at Ottawa is not residual material from inactive uranium processing sites. Subpart B of 40 C.F.R. Part 192 contains two different soil standards. The concentration criterion for surface soil (5 pCi/g of radium-226 above background) is a health-based standard. As stated in 48 Federal Register 600, the relevant source of health risk for surface soil is exposure to gamma radiation, which is the basis for this standard. The purpose of the standard was to limit the risk from inhalation of radon decay products in houses built on land and to limit gamma radiation exposure of people using contaminated land. Thus, this standard is relevant and appropriate to the Ottawa Radiation Site.

The concentration criterion for subsurface soil in Subpart B (15 pCi/g of radium-226) is not a health-based standard, but rather was developed for use in limited circumstances to allow the use of field measurements rather than laboratory analyses to determine when buried tailings had been detected. Thus, the subsurface standard is not relevant and appropriate to the residential areas.

The cleanup standard is established as the removal of soils exhibiting levels of radium-226 at 5 pCi/g above background. The background level of radium-226 in the Ottawa areas was determined to be 1.2 pCi/g. Therefore the cleanup level for radium-226 in soils in residential areas is 6.2 pCi/g and thus meets 40 C.F.R. Part 192.

2.13.2.2 *Frontage Property of NPL-8:* The selected remedy for the Frontage Property of NPL-8 meets ARARs set forth in Table 2-17. The selected remedy meets the supplemental standards under 40 C.F.R. § 192.21 in lieu of the standards in 40 C.F.R.§ 192.12(a). Supplemental standards are relevant and appropriate for the Frontage Property because the contaminated material below 10 feet bgs does not pose a clear present or future hazard as set forth in 40 C.F.R. § 192.21. Implementation of Alternative 4b, excavation of the radium-226 contaminated soil down to10 feet, will remove the risk

attributable to ingestion of contaminated soil, inhalation of fugitive dust, and external exposure to the commercial/industrial user or construction worker. Further protection is provided with land use restrictions prohibiting disturbances of the 10-foot soil cover. The RESRAD model was run to identify the residual human health risk associated with radon gas from residual radium-226 contamination below 10 feet after implementation of Alternative 4b. The risk for the outdoor scenario is negligible after implementation of Alternative 4b. The risk estimate for indoor radon inhalation in the indoor/outdoor scenario was not acceptable without radon reduction equipment on any building. Alternative 4b addresses this risk by restricting land use to construction of only slab on grade buildings and requiring radon reduction equipment on any slab on grade buildings.

2.13.3 *Other Criteria, Advisories, or Guidance To Be Considered (TBCs) for this Remedial Action*: In implementing remedies, U.S. EPA and the state will often consider a number of non-binding criteria as criteria "to be considered" (TBCs). There are no TBCs for this site.

2.13.4 *Cost-Effectiveness*: The selected remedies are cost-effective for mitigating the risks associated with exposure to soil contaminated with radium-226 at the sites. Section 300.430(f)(1)(ii)(D) of the NCP requires U.S. EPA to determine cost-effectiveness by evaluating the cost of an alternative relative to its overall effectiveness. The selected remedies provide effective protection of human health to its overall effectiveness. The selected remedies provide effective protection of human health for the most reasonable potential future land use scenarios at each of the sites. For residential sites including NPL-11, the selected remedy provides a far greater protection than the no-action alternatives. In the case of the Frontage Property, the selected remedy provides as much or greater protection of human health than Alternatives 1b, 2b, and 3b, at a lower cost. Alternative 4b and 5b are equal in terms of protectiveness, but 5b is more expensive. U.S. EPA determined the relationship of the overall effectiveness of the selected remedies to be proportional to their cost and hence represent a reasonable value for the money to be spent.

2.13.5 *Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable*: U.S. EPA has determined that the selected remedies represent the maximum extent to which permanent solutions and treatment technologies can be utilized in a practical manner. Permanent solutions in the form of removal and off-site disposal are being utilized at each of the sites.

2.13.6 *Preference for Treatment as a Principal Element:* The selected remedies will not satisfy the preference for remedial actions in which treatment permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, and contaminants are a principal element. U.S. EPA has determined that the radium-226 contamination does not meet characteristics of material requiring treatment as described in OSWER Directive 9380.3-06FS entitled "A Guide to Principal Threat and Low Level

Threat Wastes." Therefore, options utilizing a combination of off-site disposal and institutional controls were selected.

2.13.7 *Five-Year Review Requirements:* The selected remedy for Frontage Property will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure. Therefore, U.S. EPA will conduct a review within five years after the initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

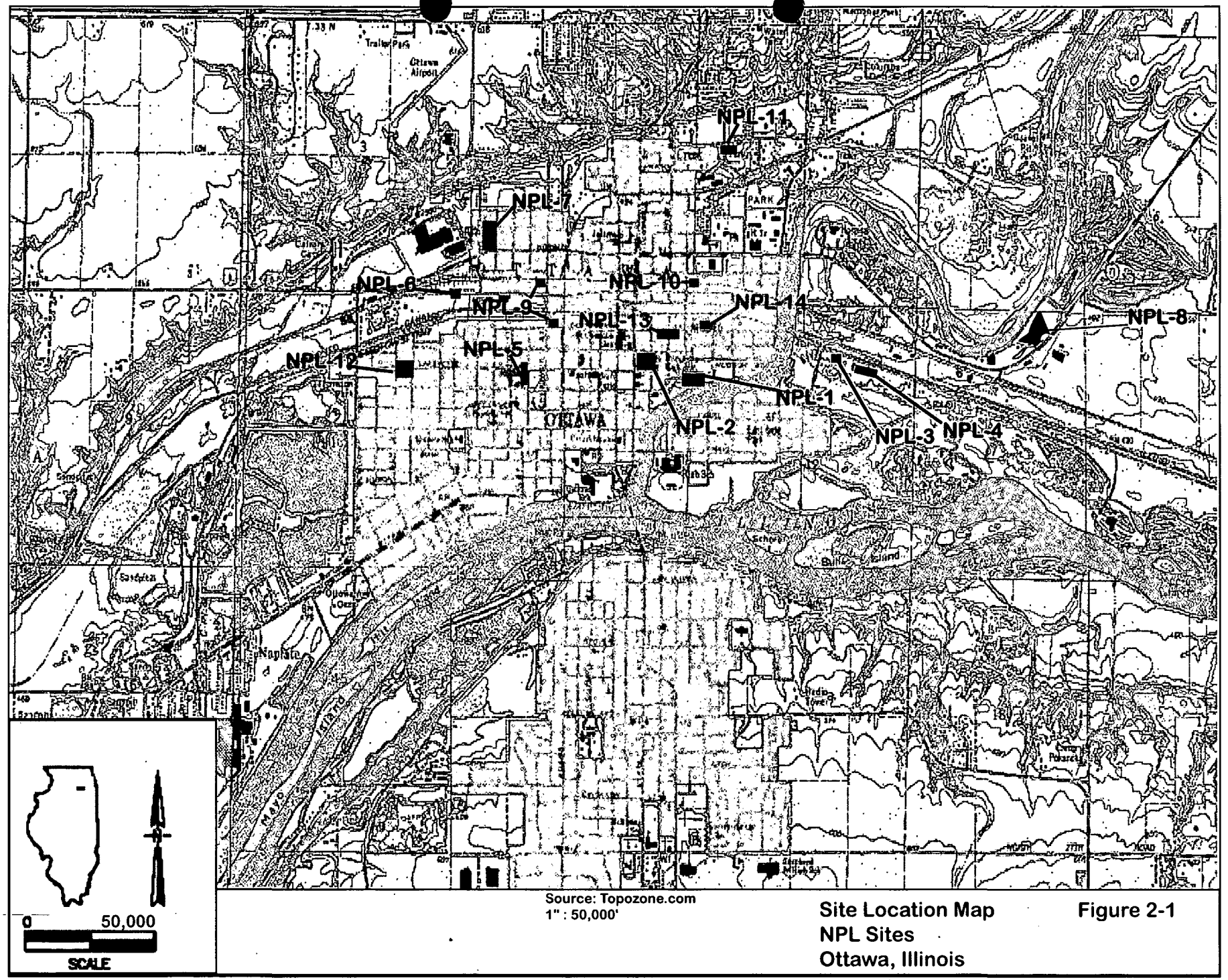
2.14 Documentation of Significant Changes The Proposed Plan was issued for public comment on July 16, 2003. U.S. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

PART 3: RESPONSIVENESS SUMMARY

3.1 Stakeholder Issues and EPA Responses The United States Environmental Protection Agency (U.S. EPA) received written comments during the comment period and verbal comments during the public meeting. The comments and U.S. EPA's responses are included in the Responsiveness Summary as Appendix A of this document. The community has indicated that it supports U.S. EPA's recommendation.

3.2 Technical and Legal Issues There are no technical or legal issues.

FIGURES



Source: Topozone.com
1" : 50,000'

Site Location Map **Figure 2-1**
NPL Sites
Ottawa, Illinois

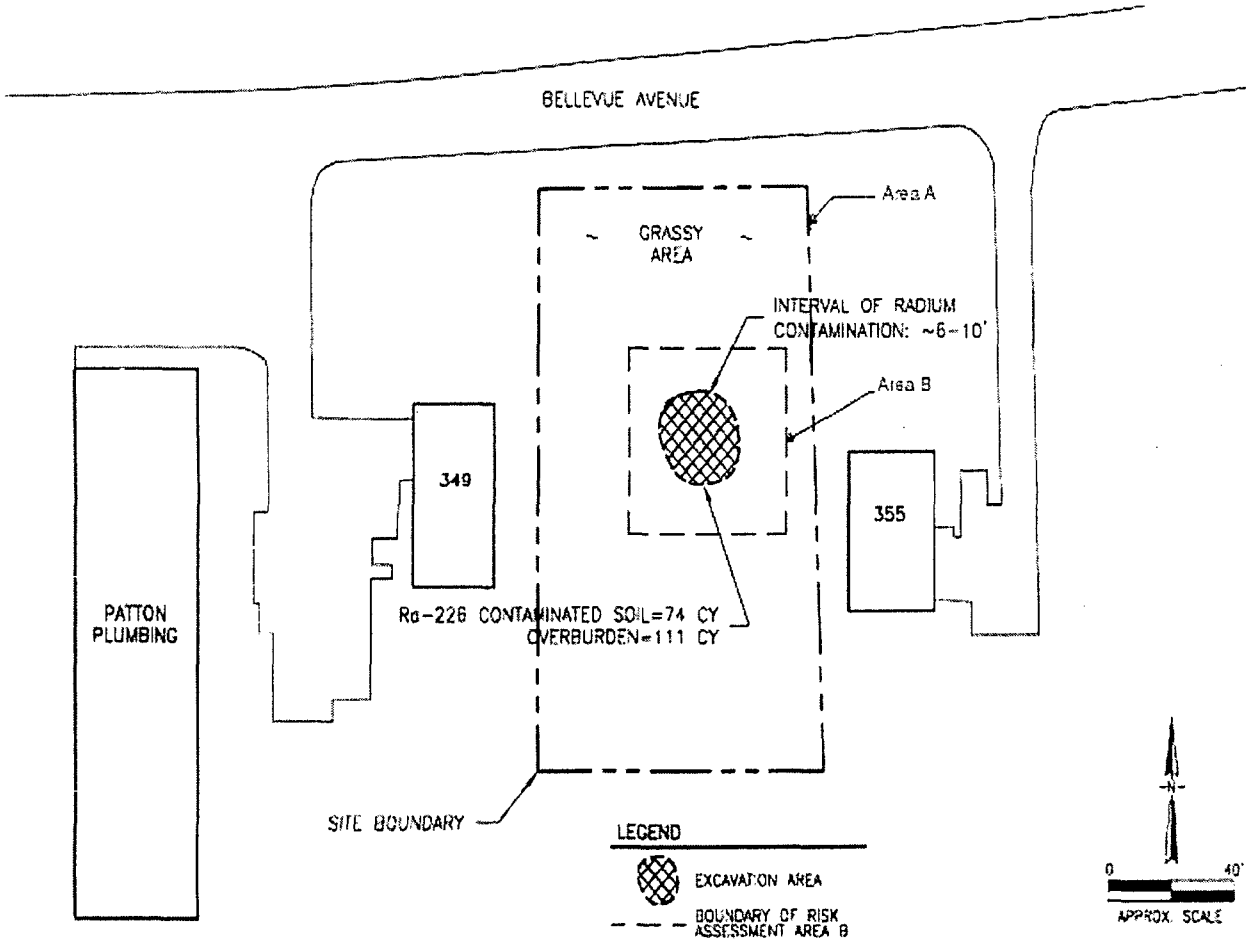


Figure 2-2

NPL-11 Site Layout

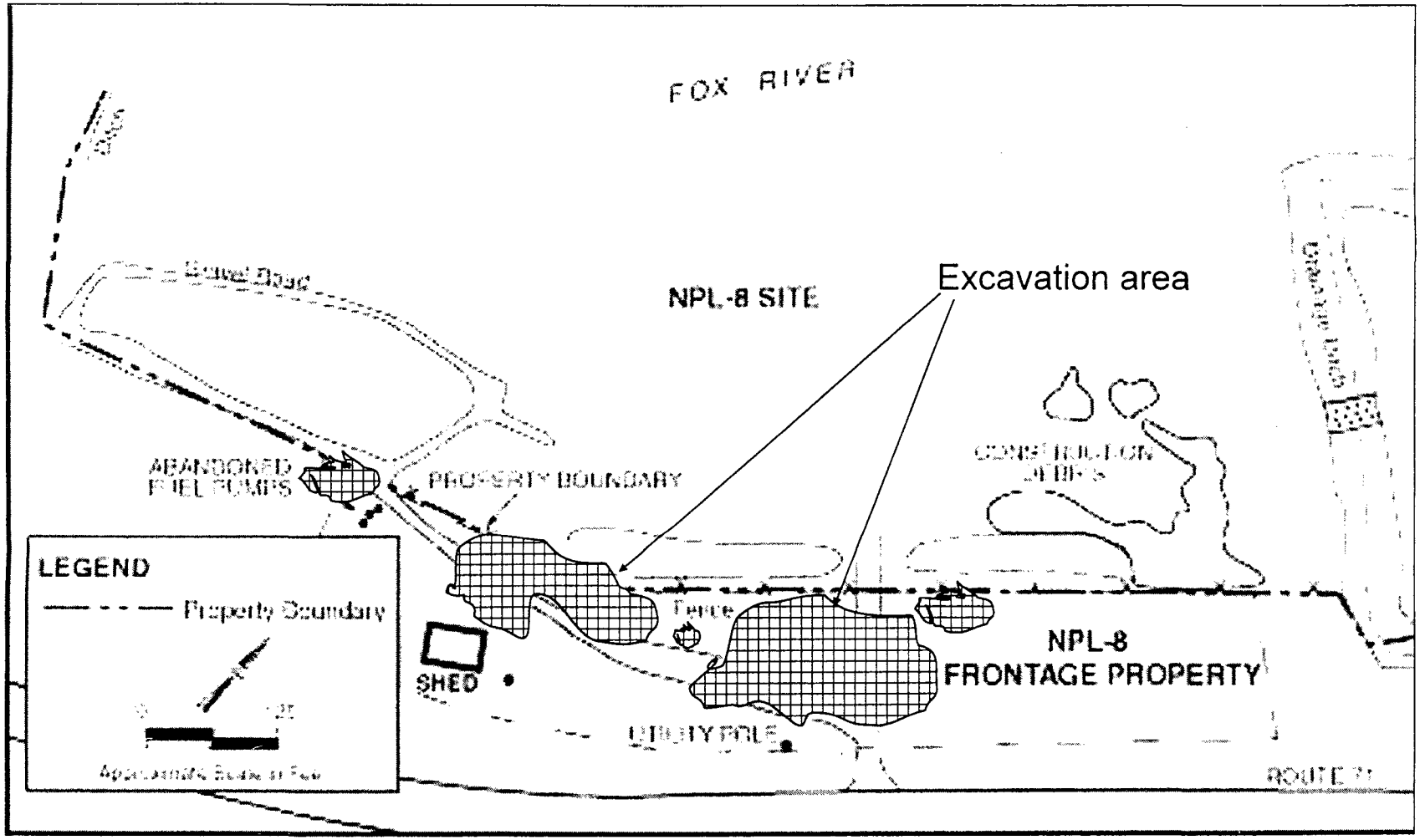


Figure 2-3

NPL-8 Site Layout

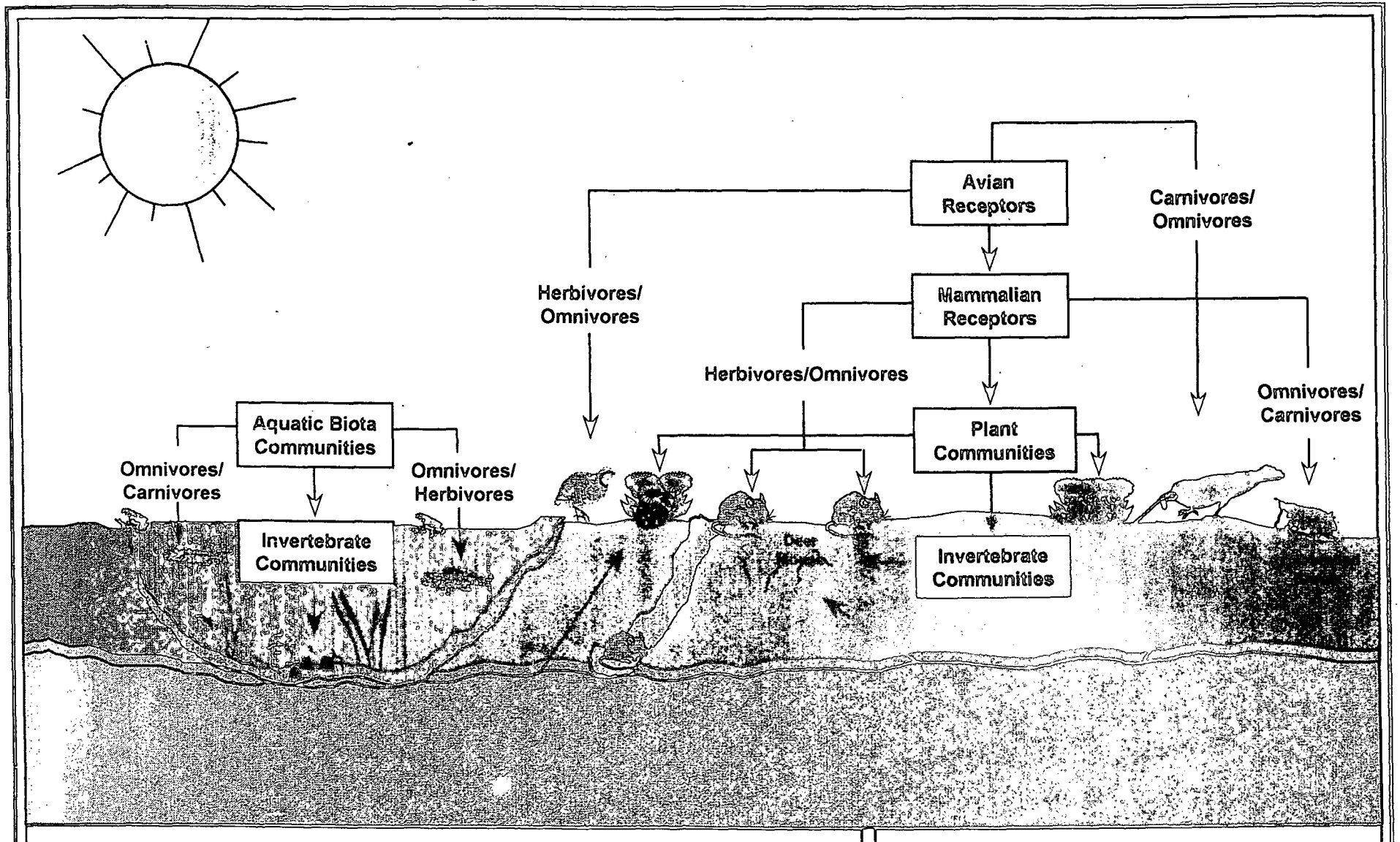


Figure 2-4

Ottawa Radiation Areas

Receptor and Community Feeding Relationships Model

TABLES

Table 2-1

Total Carcinogenic Risk Associated with Radium-226 Exposure
NPL-11 Site, Area A
Ottawa, Illinois

Exposure Route	Total Lifetime Cancer Risk					
	Residential Land Use (adult + child)		Trespasser Land Use (adolescent)		Construction Worker (adult)	
	RME	RAE	RME	RAE	RME	RAE
Ingestion	9.7E-07	3.0E-07	4.6E-08	2.3E-08	1.1E-08	1.1E-08
External exposure	3.0E-04	6.0E-05	5.8E-06	1.4E-06	2.9E-07	1.4E-07
Inhalation	1.1E-09	2.1E-10	5.5E-11	2.1E-11	3.5E-11	2.3E-11
Subtotal	3.0E-04	6.0E-05	5.8E-06	1.4E-07	3.0E-07	1.5E-07
Indoor radon inhalation	3.5E-03	6.93E-04	--	--	--	--
Outdoor radon inhalation	6.1E-05	1.2E-05	3.0E-06	1.1E-06	1.7E-07	1.2E-07
Subtotal	3.6E-03	7.1-04	3.0E-06	1.1E-06	1.7E-07	1.2E-07
TOTAL	4E-03	8E-04	9E-06	1E-06	5E-07	3E-07

-- Not applicable.

Table 2-2

Total Carcinogenic Risk Associated with Radium-226 Exposure
NPL-11 Site, Area B
Ottawa, Illinois

Exposure Route	Total Lifetime Cancer Risk					
	Residential Land Use (adult + child)		Trespasser Land Use (adolescent)		Construction Worker (adult)	
	RME	RAE	RME	RAE	RME	RAE
Ingestion	2.3E-03	6.9E-04	1.1E-04	5.3E-05	2.6E-05	2.6E-05
External exposure	7.0E-01	1.4E-01	1.3E-02	3.3E-03	6.7E-04	3.3E-04
Inhalation	2.4E-06	4.8E-07	1.3E-07	4.9E-08	8.0E-08	5.3E-08
Subtotal	7.0E-01	1.4E-01	1.3E-02	3.4E-03	7.0E-04	3.6E-04
Indoor radon inhalation	8.0E+00	1.6E+00	--	--	--	--
Outdoor radon inhalation	1.4E-01	2.8E-02	6.8E-03	2.6E-03	4.0E-04	2.7E-04
Subtotal	8.1E+00	1.6E+00	6.8E-03	2.6E-03	4.0E-04	2.7E-04
TOTAL	1E+00	1E+00	2E-02	6E-03	1E-03	6E-04

-- Not applicable.

Table 2-3

Radionuclide Carcinogenicity — Slope Factors
NPL-11 Site
Ottawa, Illinois

Element (Atomic Number)	Isotope [a]	CASRN [b]	Weight of Evidence Classification [c]	Radioactive Half-Life [d]	ICRP Lung Class [e]	GI Absorption Factor (f1)[f]	Slope Factor — Lifetime Excess Total Cancer Risk per Unit Intake of Exposure		
							Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
Radium (88)	Ra-226+D	013982-63-3(+D)	A	1,600 yrs	W	0.20	2.96E-10	--	6.74E-06
Radon (86) [h]	Rn-222+D	014859-67-7(+D)	A	3.82 days	*	ND	ND	1.80E-12	g

Source: Health Effects Summary Tables - HEAST (U.S. EPA, 1995).

ND = Not determined because data is not available, inadequate, or under review.

[a] For each radionuclide listed, slope factors correspond to the risks per unit intake or exposure for that radionuclide only, except when marked with a "+D" to indicate that the risks from radioactive decay chain products are also included. Slope factor includes the contribution of short-lived decay products, assuming equal activity concentrations (i.e., secular equilibrium) with the principal nuclide in the environment.

[b] Chemical Abstracts Service Registry Number (CASRN).

[c] U.S. EPA's weight of evidence classification of carcinogens is applicable to both chemical and radiological carcinogens. U.S. EPA classifies all radionuclides as Group A (known human carcinogens.

[d] For those radionuclides with decay products (i.e., +D), half-lives are listed for parent radionuclide.

[e] Lung clearance classification recommended by the International Commission on Radiological Protection (ICRP); W = week, * = gas.

[f] Gastrointestinal (GI) absorption factors are the fractional amounts of each radionuclide absorbed across the GI tract into the bloodstream.

[g] External exposure slope factor for radon-222 is included with the radium-226 and its short-lived progeny external slope factor.

[h] To derive the inhalation slope factor for radon-222 and its short-lived progeny, U.S. EPA's Office of Radiation and Indoor Air (ORIA) uses a risk model based on radon decay product exposure and the following exposure assumptions: inhalation rate of 2.2E+04 L/day; 50% equilibrium for decay products; risk coefficient of 2.36E-04 cases per working level month (WLM).

TABLE 2-4 RME (1 of 16)
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
NPL-11 Site, Area A
OTTAWA, ILLINOIS

Scenario Timeframe:	Future
Medium:	Surface soil
Exposure Medium:	Surface soil
Exposure Point:	Surface soil
Receptor Population:	Resident
Receptor Age:	Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	2.61	pCi/g	2.61	pCi/g	M	1.10E+02	pCi	2.96E-10	Risk/pCi	3.20E-07
Total											3.20E-07
Inhalation	Radium-226	2.61	pCi/g	2.61	pCi/g	M	3.32E-01	pCi	2.75E-09	Risk/pCi	9.10E-10
Total											9.10E-10
External	Radium-226	2.61	pCi/g	2.61	pCi/g	M	3.60E+01	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	2.40E-04
Total											2.40E-04
Inhalation - radon outdoor	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	4.86E-05
Total											4.86E-05
										Total Risk Across All Exposure Routes/Pathways	2.89E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 2-4 CTE (2 of 16)
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
NPL-11 Site, Area A
OTTAWA, ILLINOIS

Scenario Timeframe:	Future
Medium:	Surface soil
Exposure Medium:	Surface soil
Exposure Point:	Surface soil
Receptor Population:	Resident
Receptor Age:	Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	2.61	pCi/g	2.61	pCi/g	M	3.65E+02	pCi	2.96E-10	Risk/pCi	1.10E-07
Total											1.10E-07
Inhalation	Radium-226	2.61	pCi/g	2.61	pCi/g	M	6.42E-02	pCi	2.75E-09	Risk/pCi	1.80E-10
Total											1.80E-10
External	Radium-226	2.61	pCi/g	2.61	pCi/g	M	7.01E+00	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	4.70E-05
Total											4.70E-05
Inhalation - radon outdoor	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	9.39E-06
Total											9.39-06
										Total Risk Across All Exposure Routes/Pathways	4.71E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 2-4 RME (3 of 16)
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
NPL-11 Site, Area A
OTTAWA, ILLINOIS

Scenario Timeframe:	Future
Medium:	Surface soil
Exposure Medium:	Surface soil
Exposure Point:	Surface soil
Receptor Population:	Resident
Receptor Age:	Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	2.61	pCi/g	2.61	pCi/g	M	2.19E+02	pCi	2.96E-10	Risk/pCi	6.50E-07
Total											6.50E-07
Inhalation	Radium-226	2.61	pCi/g	2.61	pCi/g	M	4.98E-02	pCi	2.75E-09	Risk/pCi	1.40E-10
Total											1.40E-10
External	Radium-226	2.61	pCi/g	2.61	pCi/g	M	9.01E+00	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	6.10E-05
Total											6.10E-05
Inhalation - radon outdoor	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	1.28E-05
Total											1.28E-05
										Total Risk Across All Exposure Routes/Pathways	7.45E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 2-4 CTE (4 of 16)
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
NPL-11 Site, Area A
OTTAWA, ILLINOIS

Scenario Timeframe:	Future
Medium:	Surface soil
Exposure Medium:	Surface soil
Exposure Point:	Surface soil
Receptor Population:	Resident
Receptor Age:	Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	2.61	pCi/g	2.61	pCi/g	M	6.39E+02	pCi	2.96E-10	Risk/pCi	1.90E-07
Total											1.90E-07
Inhalation	Radium-226	2.61	pCi/g	2.61	pCi/g	M	1.04E-02	pCi	2.75E-09	Risk/pCi	2.90E-11
Total											2.90E-11
External	Radium-226	2.61	pCi/g	2.61	pCi/g	M	2.00E+00	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	1.30E-05
Total											1.30E-05
Inhalation - radon outdoor	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	2.68E-06
Total											2.68E-06
										Total Risk Across All Exposure Routes/Pathways	1.59E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 2-4 RME (5 of 16)
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
NPL-11 Site, Area A
OTTAWA, ILLINOIS

Scenario Timeframe:	Current/Future
Medium:	Surface soil
Exposure Medium:	Surface soil
Exposure Point:	Surface soil
Receptor Population:	Trespasser / Visitor
Receptor Age:	Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	2.61	pCi/g	2.61	pCi/g	M	1.57E+02	pCi	2.96E-10	Risk/pCi	4.60E-08
Total											4.60E-08
Inhalation	Radium-226	2.61	pCi/g	2.61	pCi/g	M	2.02E-02	pCi	2.75E-09	Risk/pCi	5.50E-11
Total											5.50E-11
External	Radium-226	2.61	pCi/g	2.61	pCi/g	M	8.58E-01	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	5.80E-06
Total											5.80E-06
Inhalation - radon outdoorl	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	2.95E-06
Total											2.95E-06
										Total Risk Across All Exposure Routes/Pathways	8.80E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 2-4 CTE (6 of 16)
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
NPL-11 Site, Area A
OTTAWA, ILLINOIS

Scenario Timeframe:	Current/Future
Medium:	Surface soil
Exposure Medium:	Surface soil
Exposure Point:	Surface soil
Receptor Population:	Trespasser / Visitor
Receptor Age:	Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	2.61	pCi/g	2.61	pCi/g	M	7.83E+01	pCi	2.96E-10	Risk/pCi	2.30E-08
Total											2.30E-08
Inhalation	Radium-226	2.61	pCi/g	2.61	pCi/g	M	7.71E-03	pCi	2.75E-09	Risk/pCi	2.10E-11
Total											2.10E-11
External	Radium-226	2.61	pCi/g	2.61	pCi/g	M	2.15E-01	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	1.40E-06
Total											1.40E-06
Inhalation - radon outdoor	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	1.13E-06
Total											1.13E-06
										Total Risk Across All Exposure Routes/Pathways	2.55E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 2.4 RME (7 of 16)
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
NPL-11 Site, Area A
OTTAWA, ILLINOIS

Scenario Timeframe:	Current/Future
Medium:	Subsurface soil
Exposure Medium:	Subsurface soil
Exposure Point:	Subsurface soil
Receptor Population:	Construction worker
Receptor Age:	Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	2.61	pCi/g	2.61	pCi/g	M	3.76E+01	pCi	2.96E-10	Risk/pCi	1.10E-08
Total											1.10E-08
Inhalation	Radium-226	2.61	pCi/g	2.61	pCi/g	M	1.26E-02	pCi	2.75E-09	Risk/pCi	3.50E-11
Total											3.50E-11
External	Radium-226	2.61	pCi/g	2.61	pCi/g	M	4.29E-02	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	2.90E-07
Total											2.90E-07
Inhalation - radon outdoor	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	1.74E-07
Total											1.74E-07
										Total Risk Across All Exposure Routes/Pathways	4.75E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 2-4 CTE (8 of 16)
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
NPL-11 Site, Area A
OTTAWA, ILLINOIS

Scenario Timeframe:	Current/Future
Medium:	Subsurface soil
Exposure Medium:	Subsurface soil
Exposure Point:	Subsurface soil
Receptor Population:	Construction worker
Receptor Age:	Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	2.61	pCi/g	2.61	pCi/g	M	3.76E+01	pCi	2.96E-10	Risk/pCi	1.10E-08
Total											1.10E-08
Inhalation	Radium-226	2.61	pCi/g	2.61	pCi/g	M	8.37E-03	pCi	2.75E-09	Risk/pCi	2.30E-11
Total											2.30E-11
External	Radium-226	2.61	pCi/g	2.61	pCi/g	M	2.15E-02	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	1.40E-07
Total											1.40E-07
Inhalation - radon outdoor	Radium-226	2.61	pCi/g	2.61	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	1.15E-07
Total											1.15E-07
										Total Risk Across All Exposure Routes/Pathways	2.66E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 2-4 RME (9 of 16)
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
NPL-11 Site, Area B
OTTAWA, ILLINOIS

Scenario Timeframe:	Future
Medium:	Surface soil
Exposure Medium:	Surface soil
Exposure Point:	Surface soil
Receptor Population:	Resident
Receptor Age:	Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	6016	pCi/g	6016	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	6016	pCi/g	6016	pCi/g	M	2.53E+06	pCi	2.96E-10	Risk/pCi	7.50E-04
Total											7.50E-04
Inhalation	Radium-226	6016	pCi/g	6016	pCi/g	M	7.66E+02	pCi	2.75E-09	Risk/pCi	2.10E-06
Total											2.10E-06
External	Radium-226	6016	pCi/g	6016	pCi/g	M	8.31E+04	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	5.60E-01
Total											5.60E-01
Inhalation - radon outdoor	Radium-226	6016	pCi/g	6016	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	1.12E-01
Total											1.12E-01
										Total Risk Across All Exposure Routes/Pathways	6.73E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 2-4 CTE (10 of 16)
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
NPL-11 Site, Area B
OTTAWA, ILLINOIS

Scenario Timeframe:	Future
Medium:	Surface soil
Exposure Medium:	Surface soil
Exposure Point:	Surface soil
Receptor Population:	Resident
Receptor Age:	Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	6016	pCi/g	6016	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	6016	pCi/g	6016	pCi/g	M	8.42E+05	pCi	2.96E-10	Risk/pCi	2.50E-04
Total											2.50E-04
Inhalation	Radium-226	6016	pCi/g	6016	pCi/g	M	1.48E+02	pCi	2.75E-09	Risk/pCi	4.10E-07
Total											4.10E-07
External	Radium-226	6016	pCi/g	6016	pCi/g	M	1.62E+04	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	1.10E-01
Total											1.10E-01
Inhalation - radon outdoor	Radium-226	6016	pCi/g	6016	pCi/g	M	1.62E+04	--	7.70E-12	Risk/yr per pCi/g soil	2.17E-02
Total											2.17E-02
										Total Risk Across All Exposure Routes/Pathways	1.32E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 2-4 RME (11 of 16)
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
NPL-11 Site, Area B
OTTAWA, ILLINOIS

Scenario Timeframe:	Future
Medium:	Surface soil
Exposure Medium:	Surface soil
Exposure Point:	Surface soil
Receptor Population:	Resident
Receptor Age:	Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	6016	pCi/g	6016	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	6016	pCi/g	6016	pCi/g	M	5.05E+06	pCi	2.96E-10	Risk/pCi	1.50E-03
Total											1.50E-03
Inhalation	Radium-226	6016	pCi/g	6016	pCi/g	M	1.15E+02	pCi	2.75E-09	Risk/pCi	3.20E-07
Total											3.20E-07
External	Radium-226	6016	pCi/g	6016	pCi/g	M	2.08E+04	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	1.40E-01
Total											1.40E-01
Inhalation - radon outdoor	Radium-226	6016	pCi/g	6016	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	2.94E-02
Total											2.94E-02
										Total Risk Across All Exposure Routes/Pathways	1.71E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 2-4 CTE (12 of 16)
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
NPL-11 Site, Area B
OTTAWA, ILLINOIS

Scenario Timeframe:	Future
Medium:	Surface soil
Exposure Medium:	Surface soil
Exposure Point:	Surface soil
Receptor Population:	Resident
Receptor Age:	Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	6016	pCi/g	6016	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	6016	pCi/g	6016	pCi/g	M	1.47E+06	pCi	2.96E-10	Risk/pCi	4.40E-04
Total											4.40E-04
Inhalation	Radium-226	6016	pCi/g	6016	pCi/g	M	2.41E+01	pCi	2.70E-09	Risk/pCi	6.60E-08
Total											6.60E-08
External	Radium-226	6016	pCi/g	6016	pCi/g	M	4.62E+03	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	3.10E-02
Total											3.10E-02
Inhalation - radon outdoor	Radium-226	6016	pCi/g	6016	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	6.17E-03
Total											6.17E-03
										Total Risk Across All Exposure Routes/Pathways	3.76E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 2-4 RME (13 of 16)
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
NPL-11 Site, Area B
OTTAWA, ILLINOIS

Scenario Timeframe:	Current/Future
Medium:	Surface soil
Exposure Medium:	Surface soil
Exposure Point:	Surface soil
Receptor Population:	Trespasser / Visitor
Receptor Age:	Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	6016	pCi/g	6016	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	6016	pCi/g	6016	pCi/g	M	3.61E+05	pCi	2.96E-10	Risk/pCi	1.10E-04
Total											1.10E-04
Inhalation	Radium-226	6016	pCi/g	6016	pCi/g	M	4.65E+01	pCi	2.75E-09	Risk/pCi	1.30E-07
Total											1.30E-07
External	Radium-226	6016	pCi/g	6016	pCi/g	M	1.98E+03	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	1.30E-02
Total											1.30E-02
Inhalation - radon outdoor	Radium-226	6016	pCi/g	6016	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	6.80E-03
Total											6.80E-03
										Total Risk Across All Exposure Routes/Pathways	1.99E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 2-4 CTE (14 of 16)
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
NPL-11 Site, Area B
OTTAWA, ILLINOIS

Scenario Timeframe:	Current/Future
Medium:	Surface soil
Exposure Medium:	Surface soil
Exposure Point:	Surface soil
Receptor Population:	Trespasser / Visitor
Receptor Age:	Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	6016	pCi/g	6016	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	6016	pCi/g	6016	pCi/g	M	1.80E+05	pCi	2.96E-10	Risk/pCi	5.30E-05
Total											5.30E-05
Inhalation	Radium-226	6016	pCi/g	6016	pCi/g	M	1.78E+01	pCi	2.75E-09	Risk/pCi	4.90E-08
Total											4.90E-08
External	Radium-226	6016	pCi/g	6016	pCi/g	M	4.94E+02	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	3.30E-03
Total											3.30E-03
Inhalation - radon outdoor	Radium-226	6016	pCi/g	6016	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	2.60E-03
Total											2.60E-03
										Total Risk Across All Exposure Routes/Pathways	5.95E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 2-4 RME (15 of 16)
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
NPL-11 Site, Area B
OTTAWA, ILLINOIS

Scenario Timeframe:	Current/Future
Medium:	Subsurface soil
Exposure Medium:	Subsurface soil
Exposure Point:	Subsurface soil
Receptor Population:	Construction worker
Receptor Age:	Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	6016	pCi/g	6016	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	6016	pCi/g	6016	pCi/g	M	1.10E+02	pCi	2.96E-10	Risk/pCi	2.60E-05
Total											2.60E-05
Inhalation	Radium-226	6016	pCi/g	6016	pCi/g	M	2.91E+01	pCi	2.75E-09	Risk/pCi	8.00E-08
Total											8.00E-08
External	Radium-226	6016	pCi/g	6016	pCi/g	M	9.89E+01	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	6.70E-04
Total											6.70E-04
Inhalation - radon outdoor	Radium-226	6016	pCi/g	6016	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	4.00E-04
Total											4.00E-04
										Total Risk Across All Exposure Routes/Pathways	1.10E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 2-4 CTE (16 of 16)
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
NPL-11 Site, Area B
OTTAWA, ILLINOIS

Scenario Timeframe:	Current/Future
Medium:	Subsurface soil
Exposure Medium:	Subsurface soil
Exposure Point:	Subsurface soil
Receptor Population:	Construction worker
Receptor Age:	Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Radium-226	6016	pCi/g	6016	pCi/g	M	--	--	--	--	--
Total											--
Ingestion	Radium-226	6016	pCi/g	6016	pCi/g	M	8.66E+04	pCi	2.96E-10	Risk/pCi	2.60E-05
Total											2.60E-05
Inhalation	Radium-226	6016	pCi/g	6016	pCi/g	M	1.93E+01	pCi	2.75E-09	Risk/pCi	5.30E-08
Total											5.30E-08
External	Radium-226	6016	pCi/g	6016	pCi/g	M	4.94E+01	pCi-yr/g	6.74E-06	Risk/yr per pCi/g soil	3.30E-04
Total											3.30E-04
Inhalation - radon outdoor	Radium-226	6016	pCi/g	6016	pCi/g	M	--	pCi-yr/g	7.70E-12	Risk/yr per pCi/g soil	2.65E-04
Total											2.65E-04
										Total Risk Across All Exposure Routes/Pathways	6.21E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

Table 2-5
Total Cancer Risk Estimates Based on Soil Screening Levels
NPL-8 Frontage Property
Ottawa, Illinois

Receptor & Pathway-Specific SSL	Risk-Based Concentration	Soil Concentration (pCi/g)		Cancer Risk	
	(pCi/g)	(0 to 2 ft bgs)	(0 to 10 ft bgs)	(0 to 2 ft bgs)	(0 to 10 ft bgs)
Trespasser					
Radium-226 +D					
Ingestion of Soil	2.30E+01	8.159	11.042	3.55E-07	4.80E-07
Inhalation of Fugitive Dust	1.30E+04	8.159	11.042	6.28E-10	8.49E-10
External Exposure	8.00E-02	8.159	11.042	1.02E-04	1.38E-04
Ra-228 + D					
Ingestion of Soil	1.30E+01	1.109	1.178	8.53E-08	9.06E-08
Inhalation of Fugitive Dust	5.00E+04	1.109	1.178	2.22E-11	2.36E-11
External Exposure	2.60E-01	1.109	1.178	4.27E-06	4.53E-06
Cumulative Risk				1.07E-04	1.43E-04
Residential					
Radium-226 +D					
Ingestion of Soil (age-adjusted)	1.09	8.159	11.042	7.49E-06	1.01E-05
Ingestion of Produce	6.90E-02	8.159	11.042	1.18E-04	1.60E-04
Inhalation of Fugitive Dust	1.90E+03	8.159	11.042	4.29E-09	5.81E-09
External Exposure	1.32E-02	8.159	11.042	6.18E-04	8.37E-04
Ra-228 + D					
Ingestion of Soil (age-adjusted)	1.29	1.109	1.178	8.60E-07	9.13E-07
Ingestion of Produce	9.10E-02	1.109	1.178	1.22E-05	1.29E-05
Inhalation of Fugitive Dust	1.50E+04	1.109	1.178	7.39E-11	7.85E-11
External Exposure	9.20E-02	1.109	1.178	1.21E-05	1.28E-05
Cumulative Risk				7.69E-04	1.03E-03
Commercial/Industrial					
Radium-226 +D					
Ingestion of Soil	4.4	8.159	11.042	1.85E-06	2.51E-06
Inhalation of Fugitive Dust	3.10E+03	8.159	11.042	2.63E-09	3.56E-09
External Exposure	2.20E-02	8.159	11.042	3.71E-04	5.02E-04
Ra-228 + D					
Ingestion of Soil	4.4	1.109	1.178	2.52E-07	2.68E-07
Inhalation of Fugitive Dust	2.20E+04	1.109	1.178	5.04E-11	5.35E-11
External Exposure	1.30E-01	1.109	1.178	8.53E-06	9.06E-06
Cumulative Risk				3.82E-04	5.14E-04

Table 2-5
Total Cancer Risk Estimates Based on Soil Screening Levels
NPL-8 Frontage Property
Ottawa, Illinois

Receptor & Pathway-Specific SSL	Risk-Based Concentration (pCi/g)	Soil Concentration (pCi/g) (0 to 2 ft bgs)	Soil Concentration (pCi/g) (0 to 10 ft bgs)	Cancer Risk (0 to 2 ft bgs)	Cancer Risk (0 to 10 ft bgs)
Construction Worker					
Radium-226 +D					
Ingestion of Soil	9.50E+01	8.159	11.042	8.59E-08	1.16E-07
Inhalation of Fugitive Dust	2.20E+05	8.159	11.042	3.71E-11	5.02E-11
External Exposure	1.60E+00	8.159	11.042	5.10E-06	6.90E-06
Ra-228 + D					
Ingestion of Soil	32	1.109	1.178	3.47E-08	3.68E-08
Inhalation of Fugitive Dust	5.20E+05	1.109	1.178	2.13E-12	2.27E-12
External Exposure	3.20E+00	1.109	1.178	3.47E-07	3.68E-07
Cumulative Risk				5.57E-06	7.42E-06
Recreational					
Radium-226 +D					
Ingestion of Soil (age-adjusted)	6.4	8.159	11.042	1.27E-06	1.73E-06
Inhalation of Fugitive Dust	3.70E+03	8.159	11.042	2.21E-09	2.98E-09
External Exposure	2.70E-02	8.159	11.042	3.02E-04	4.09E-04
Ra-228 + D					
Ingestion of Soil (age-adjusted)	7.5	1.109	1.178	1.48E-07	1.57E-07
Inhalation of Fugitive Dust	3.10E+04	1.109	1.178	3.58E-11	3.80E-11
External Exposure	1.80E-01	1.109	1.178	6.16E-06	6.54E-06
Cumulative Risk				3.10E-04	4.17E-04

RFW105-2A-AMRZ

Table 2-6
Total Cancer Risk Estimates Based on Preliminary Remediation Goals
NPL-8 Frontage Property
Ottawa, Illinois

Receptor Group	Risk-Based Concentration (pCi/g)	Soil Concentration (pCi/g)		Cancer Risk	
		(0 to 2 ft bgs)	(0 to 10 ft bgs)	(0 to 2 ft bgs)	(0 to 10 ft bgs)
Residential					
Ra-226 + Decay Chain	1.24E-02	8.159	11.042	6.58E-04	8.90E-04
Ra-228 + Decay Chain	6.77E-02	1.109	1.178	1.64E-05	1.74E-05
Cumulative Risk				6.74E-04	9.08E-04
Indoor Worker					
Ra-226 + Decay Chain	2.55E-02	8.159	11.042	3.20E-04	4.33E-04
Ra-228 + Decay Chain	1.49E-01	1.109	1.178	7.44E-06	7.91E-06
Cumulative Risk				3.27E-04	4.41E-04
Outdoor Worker					
Ra-226 + Decay Chain	5.74E-02	8.159	11.042	1.42E-04	1.92E-04
Ra-228 + Decay Chain	3.33E-01	1.109	1.178	3.33E-06	3.54E-06
Cumulative Risk				1.45E-04	1.96E-04

Table 2-7
Radiological Data Summary
NPL-8 Frontage Property Soil
Ottawa, Illinois
(All concentrations in pCi/g)

Chemical	Frequency of Detection	Range of Detected Concentrations		95% Upper Confidence Limit (95% UCL)
		Minimum	Maximum	
All Data				
Radium 226	85 / 85	0.6	9800	18.157
Radium 228	80 / 85	0.4	2.00	1.191
0 - 10 ft bgs				
Radium 226	81 / 81	0.6	9800	11.042
Radium 228	78 / 81	0.4	2.00	1.178
0 - 2 ft bgs				
Radium 226	32 / 32	0.6	28	8.159
Radium 228	31 / 32	0.4	2.00	1.109

Table 2-8

Total Cancer Risk from Indoor Inhalation of Radon and its Decay Products from Radium-226 Contaminated Soil (0 to 24 ft bgs)
NPL-8 Frontage Property
Ottawa, Illinois

Radionuclide	Intake (pCi/year)	Cancer Slope Factor (1/pCi)	Excess Cancer Risk
Residential			
Radon-222	3.253E+07	1.80E-12	1.728E-03
Polonium-218	3.104E+07	3.70E-12	3.391E-03
Lead-214	2.348E+07	6.20E-12	4.297E-03
Bismuth-214	1.898E+07	1.50E-11	8.404E-03
TOTAL			1.782E-02
Commercial/Industrial			
Radon-222	3.253E+07	1.80E-12	1.444E-03
Polonium-218	3.104E+07	3.70E-12	2.833E-03
Lead-214	2.340E+07	6.20E-12	3.59E-03
Bismuth-214	1.898E+07	1.50E-11	7.022E-03
TOTAL			1.489E-02

TABLE 2-9
Total Cancer Risk from Radium-226 Contaminated Soil
Based on Industrial/Commerical
Land Use - Alternative 4b
(10 to 24-feet bgs with 10-foot cover)
NPL-8 Frontage Property

Outdoor Exposure (with no building)	Intake pCi/year	Cancer Slope Factor (1/pCi)	Excess Cancer Risk (After Alternative 4b)	Excess Cancer Risk (Baseline)
External Gamma				
Ra-226	N/A	8.490E-06	1.359E-19	NE
Indoor/Outdoor Exposure (with building)	**Intake pCi/year**	**Cancer Slope Factor (1/pCi)**	**Excess Cancer Risk (After Alternative 4b)**	**Excess Cancer Risk (Baseline)**
Radon Inhalation				
Radon-222	2.308E+06	1.800E-12	1.032E-04	1.444E-03
Polonium-218	2.223E+06	3.700E-12	2.043E-04	2.833E-03
Lead-214	1.682E+06	6.200E-12	2.590E-04	3.590E-03
Bismuth-214	1.360E+06	1.500E-11	5.066E-04	7.022E-03
			Total 1.073E-03	**Total** 1.489E-02
External Gamma				
Ra-226	N/A	8.490E-06	8.151E-20	NE

NE - not evaluated

Table 2-10

Comparison of Cleanup Alternatives for Residential Areas			
Evaluation of Criteria	**Alternative 1**	**Alternative 2***	**Alternative 3**
1. Overall protection of human health and the environment	☐	■	■
2. Compliance with ARARs	☐	■	■
3. Long-term effectiveness and permanence	☐	■	■
4. Reduction of toxicity, mobility or volume through treatment	☐	☐	☐
5. Short-term effectiveness	☐	■	■
6. Implementability	■	■	■
7. Cost (estimated)	**$0**	—	—
NPL-11	**$0**	**$200,000**	**N/A**
8. State acceptance	Will be evaluated after public comment period		
9. Community acceptance	Will be evaluated after public comment period		

■ Fully meets criteria ▣ Partially meets criteria ☐ Does not meet criteria * EPA's recommended alternative N/A = Not applicable

Table 2-11

Comparison of Cleanup Alternatives for NPL-8

Evaluation of Criteria	Alternatives				
	1b	2b	3b	4b*	5b
1. Overall protection of human health and the environment	☐	■	■	■	■
2. Compliance with ARARs	☐	■	■	■	■
3. Long-term effectiveness and permanence	☐	■	■	▣	▣
4. Reduction of toxicity, mobility or volume through treatment	☐	☐	☐	☐	☐
5. Short-term effectiveness	☐	■	■	■	■
6. Implementability	■	■	■	■	■
7. Cost (estimated)	$0	$9,100,000	$10,650,000	$5,820,000	$6,600,000
8. State acceptance	Will be evaluated after public comment period				
9. Community acceptance	Will be evaluated after public comment period				

■ Fully meets criteria ▣ Partially meets criteria ☐ Does not meet criteria * EPA's recommended alternative

NPL-11 (ALTERNATIVE 2)
Ottawa Radiation Areas
Ottawa, Illinois

	ENGINEER'S ESTIMATES					COMMENTS
	Quantity	Unit	Unit Price	Cost	Subtotal	
DIRECT COSTS						
MOBILIZATION/DEMOBILIZATION	1	EST	$2,500	$2,500	$2,500	Includes mobilization of equipment, utilities, and controls
SITE PREPARATION						
Clearing and Grubbing	0.5	Acre	$1,000	$500		
Access Improvements	1	EST	$1,000	$1,000		
Temporary Facilities	1	WK	$1,000	$1,000	$2,500	
EXCAVATION						
Radium-contaminated Soil	89	CY	$5	$444		In situ volume. Includes 20% over-excavation factor
Overburden Material	122	CY	$5	$611	$1,055	In situ volume. Includes 10 % over-excavation factor
ON-SITE LABORATORY	1	weeks	$7,500	$7,500	$7,500	
GROUNDWATER MANAGEMENT	13,500	GAL	$0.35	$4,725	$4,725	Assumes groundwater will be encountered during excavation activities. Includes transportation.
DEWATERING ACTIVITIES	98	CY	$25.00	$2,450	$2,450	*Assumes onsite dewatering activities using a dewatering agent* Assumes 30% swell factor from the addition of the dewatering agent
OFF-SITE TRANSPORTATION						
Radium-contaminated Soil	128	CY	$265	$33,920	$33,920	Assumes transportation to a radioactive waste landfill. Assumes 20 % swell factor
OFF-SITE DISPOSAL						
Radium-contaminated Soil	128	CY	$135	$17,280		Assumes disposal in a radioactive waste landfill. Assumes 20 % swell factor.
Groundwater	13,500	GAL	$0.05	$675	$17,955	
SITE RESTORATION						
Backfill - From an offsite source	74	CY	$20	$1,480		Assumes borrow source is within 5 miles of the site. No compaction factor applied
Backfill - Using excavated overburden material	122	CY	$5	$611		
Regevegetation	0.5	Acre	$1,500	$750	$2,841	
DIRECT COST SUBTOTAL					$75,445	
INDIRECT COSTS						
ENGINEERING/DESIGN/INVESTIGATION						
Engineering, Design and Permitting	1	EST	$50,000	$50,000	$50,000	
CONTRACTOR PROCUREMENTS (@ 1% of direct costs)	-	-	-	$800	$800	
CONSTRUCTION MANAGEMENT						
Resident Engineer	50	HR	$75	$3,750		One engineer for 1 week @ 50 hr/wk.
Health & Safety Monitoring	50	HR	$75	$3,750		One health physicist for 1 week @ 50 hr/wk
Per Diem (Engineer & Health Physicist)	10	DAY	$85	$850		
Car Rental	10	DAY	$65	$650		
Admin/Office Support (@ 10% of construction management labor)	-	-	-	$750		
QA/QC Testing	0.5	Acre	$2,500	$1,250		
Post-Construction Documentation and Certification	1	EST	$20,000	$20,000	$31,000	
INDIRECT COST SUBTOTAL					$81,800	
ANNUAL OPERATIONS AND MAINTENANCE (O&M) COSTS						
O&M COST SUBTOTAL					$0	
SUB-TOTAL of DIRECT AND INDIRECT COSTS					$157,245	
SUB-TOTAL of DIRECT AND INDIRECT COSTS WITH 25% CONTINGENCY					$197,000	
SUB-TOTAL of ANNUAL O&M COSTS					$0	
SUB-TOTAL of O&M COSTS WITH 25% CONTINGENCY					$0	
PRESENT WORTH of O&M COSTS WITH CONTINGENCY					$0	Assumes an interest factor of 7 % and an O&M period of 30 years.
TOTAL (DIRECT COSTS + INDIRECT COSTS + PRESENT WORTH O&M COSTS) WITH CONTINGENCY					**$200,000**	

Table 2-13

ALTERNATIVE 2b
Soil Excavation, Perched Water Collection, and Off-Site Disposal
Generic Site - Ottawa Radiation Areas
Ottawa, Illinois

	ENGINEER'S ESTIMATES					COMMENTS
	Quantity	Unit	Unit Price	Cost	Subtotal	
DIRECT COSTS						Duration of project was calculated based on the assumed production rate of 1,125 cubic yards per week.
MOBILIZATION/DEMOBILIZATION	1	EST	$25,000	$25,000	$25,000	Cost is based on the amount of equipment required to implement this alternative.
SITE PREPARATION						
Clearing and Grubbing	4	Acre	$3,000	$12,000		Cost assumes clearing and grubbing will be done in an area where a minimal amount of mature tree removal is required.
Off-site Disposal of Debris	100	CY	$60	$6,000		Cost assumes that debris found on-site can be decontaminated and will be disposed at a facility licensed to accept general construction waste. The cost includes: decontamination, screening for radioactive release criteria, transportation, and disposal.
Access Improvements	1	EST	$25,000	$25,000		Cost is based on the type of access improvements required to implement this alternative. Access improvements include construction of temporary roadways and supplying the site with the required utilities.
Temporary Facilities	29	WK	$1,500	$43,500	$86,500	Cost assumes that temporary facilities include rental trailer, restroom facilities, electrical service, phone service and a decontamination station.
EXCAVATION						
Radium Contaminated Soil	10,370	CY	$5	$51,850		Excavation quantities are estimated as in-situ volume. The quantity specified includes a 30% over-excavation factor. This over-excavation factor is based on a conceptual excavation plan.
Overburden Material	17,120	CY	$5	$85,600	$137,450	Excavation quantities are estimated as in-situ volume. The quantity specified includes a 30% over-excavation factor. This over-excavation factor is based on a conceptual excavation plan.
ON-SITE LABORATORY	29	WK	$7,500	$217,500	$217,500	Assumes an on-site laboratory will be utilized for conformation and disposal parameter sampling.
WASTE PILE AREA						
Waste Pile Area	9,500	SF	$10	$95,000		Cost assumes pad construction includes asphalt curbs and sumps, as described in Section 4 of the Generic FS text.
Pre-fabricated Building	1	EST	$50,000	$50,000	$145,000	Cost is based pre-fabricated buildings for soil storage.
OFF-SITE TRANSPORTATION						
Radium-contaminated Soil - T&D Option 5	12,400	CY	$210	$2,604,000		This option assumes that soil will be loaded into intermodal containers (assumed to be 24 cubic yards). The intermodal containers will then be transferred to flatbed trucks and transported via roadway to a nearby rail spur (assumed to be in the Ottawa area). The intermodal containers will then be transferred to flatbed rail cars, using a crane, and be transported via rail to the Envirocare Landfill in Clive, Utah. This option is assumed to be cost-effective for sites where moderate to large amount of material requires transportation and where transportation via rail is available. This option assumes that a staging area, similar to the one required in Option 6 is not available. Quantity listed assumes a 20% swell factor.
Overburden Material (Special Waste)	20,500	CY	$20	$410,000	$3,014,000	Assumes transportation to the special waste landfill in Batavia, Illinois. Transportation will be accomplished using covered dump-trucks via roadway. Quantity listed assumes a 20% swell factor.
OFF-SITE DISPOSAL						
Radium-contaminated Soil	12,400	CY	$135	$1,674,000		Cost assumes radium-contaminated soil will be disposed at the Envirocare Landfill in Clive, Utah. The unit price listed assumes that the project will negotiate a disposal rate equivalent to the standard Army Corps rate used at Envirocare. If this rate can not be negotiated, the unit cost for disposal of radium-contaminated soil will increase significantly.
Overburden Material (Special Waste)	20,500	CY	$35	$717,500		Cost assumes overburden material will be classified as special waste and disposed at Settlers Hill Landfill in Batavia, Illinois.
Groundwater	260,000	GAL	$0.05	$13,000	$2,404,500	Assumes the groundwater will be disposed of at the City of Ottawa wastewater treatment plant.

Table 2-13

PERCHED WATER MANAGEMENT	260,000	GAL	$0.35	$91,000	$91,000	Assumes typical groundwater extraction methods will be used, i.e. well-point system or sumps. Cost includes collection of water, pumping to storage tanks, filtering of water, transfer of water from on-site storage tanks to transportation vehicles for disposal, and transportation to the point of discharge/disposal.
SITE RESTORATION						
Backfill	27,490	CY	$20	$549,800		Assumes borrow source is within 5 miles of the site. No compaction factor is applied to the quantity listed.
Revegetation	4	Acre	$2,500	$10,000	$559,800	Cost assumes revegetation includes topsoil and hydroseeding.
DIRECT COST SUBTOTAL					$6,680,750	
INDIRECT COSTS						
ENGINEERING/DESIGN/INVESTIGATION						
Engineering and Design	1	EST	$100,000	$100,000	$100,000	
CONTRACTOR PROCUREMENTS (@ 1% of direct costs)	1	EST	$66,808	$66,808	$66,808	Cost is assumed to be $100,000
CONSTRUCTION MANAGEMENT						
Resident Engineer	1,450	HR	$75	$108,750		This cost is based on one on-site engineer, working approximately 10 hours per day, or 50 hours per week.
Health & Safety Monitoring	1,450	HR	$75	$108,750		This cost is based on one on-site health physicist, working approximately 10 hours per day, or 50 hours per week.
Admin/Office Support (@ 10% of construction management labor)	1	EST	$21,750	$21,750		Cost is assumed to be approximately 10% of the labor costs listed above.
Per Diem	290	DAY	$85	$24,650		Cost assumes a lodging rate of $55 per day and a M&IE of $30 per day - for Resident Engineer and Health Physicist
Car Rental	290	DAY	$65	$18,850		Cost assumes one rental car will be required for each person on-site.
Surveying	1	EST	$15,000	$15,000		Cost is based on the size of the site and the area where a survey is required.
Post-Construction Documentation and Certification	1	EST	$50,000	$50,000		This cost is based on the amount of effort required to provide post-construction documentation and certification.
QA/QC Testing	1	EST	$25,000	$25,000		This cost is based on the amount of effort required to collect and analyze QA/QC samples to ensure that the radium-226 contamination has been removed.
Site Security	29	WK	$2,000	$58,000	$430,750	Potential security options include security personnel and temporary security fencing.
INDIRECT COST SUBTOTAL					$597,558	
ANNUAL OPERATIONS AND MAINTENANCE (O&M) COSTS						
ANNUAL O&M COST SUBTOTAL					$0	
SUB-TOTAL of DIRECT AND INDIRECT COSTS					$7,278,308	
SUB-TOTAL of DIRECT AND INDIRECT COSTS WITH 25% CONTINGENCY					$9,098,000	
SUB-TOTAL of O&M COSTS					$0	
SUB-TOTAL of O&M COSTS WITH 25% CONTINGENCY					$0	
PRESENT WORTH of O&M COSTS WITH CONTINGENCY					$0	Assumes an interest factor of 7 % and an O&M period of 30 years.
TOTAL COST (DIRECT COSTS + INDIRECT COSTS + PRESENT WORTH COSTS) WITH CONTINGENCY					**$9,100,000**	

Table 2-14

ALTERNATIVE 3b
Soil Excavation, Perched Water Collection, Volume Reduction, and Off-Site Disposal
Generic Site - Ottawa Radiation Areas
Ottawa, Illinois

	ENGINEER'S ESTIMATES					COMMENTS
	Quantity	Unit	Unit Price	Cost	Subtotal	
DIRECT COSTS						Duration of project was calculated based on the assumed production rate of 750 cubic yards per week.
MOBILIZATION/DEMOBILIZATION	1	EST	$25,000	$25,000	$25,000	Cost is based on the amount of equipment required to implement this alternative.
SITE PREPARATION						
Clearing and Grubbing	4	Acre	$3,000	$12,000		Cost assumes clearing and grubbing will be done in an area where a minimal amount of mature tree removal is required.
Off-site Disposal of Debris	100	CY	$60	$6,000		Cost assumes that debris found on-site can be decontmaminated and will be disposed at a facility licensed to accept general construction waste. The cost includes: decontamination, screening for radioactive release criteria, transportation, and disposal.
Access Improvements	1	EST	$25,000	$25,000		Cost is based on the type of access improvements required to implement this alternative. Access improvements include construction of temporary roadways and supplying the site with the required utilities.
Temporary Facilities	44	WK	$1,500	$66,000	$109,000	Cost assumes that temporary facilities include rental trailer, restroom facilities, electrical service, phone service, and a decontamination station.
EXCAVATION						
Radium Contaminated Soil	5,760	CY	$5	$28,800		Excavation quantities are estimated as in-situ volume The quantity specified includes a 30% over-excavation factor. This over-excavation factor is based on a conceptual excavation plan.
Overburden Material	21,740	CY	$5	$108,700	$137,500	Excavation quantities are estimated as in-situ volume The quantity specified includes a 30% over-excavation factor This over-excavation factor is based on a conceptual excavation plan.
ON-SITE LABORATORY	44	WK	$7,500.00	$330,000	$330,000	Assumes an on-site laboratory will be utilized for conformation and disposal parameter sampling.
WASTE PILE AREA						
Waste Pile Area	8,100	SF	$10	$81,000		Cost assumes pad construction includes asphalt curbs and sumps, as described in Section 4 of the Generic FS tex
Pre-fabricated Building	1	EST	$100,000	$100,000	$181,000	Cost is based on pre-fabricated buildings for the SGS and soil storage.
SEGMENTED GATE SYSTEM	33,000	CY	$75	$2,475,000	$2,475,000	Unit cost includes costs for mobilization, assembly, calibration, operation, disassembly, and demobilization. Assumes a 20% swell factor.
OFF-SITE TRANSPORTATION						
Radium-contaminated Soil - T&D Option 5	6,900	CY	$210	$1,449,000		This option assumes that soil will be loaded into intermodal containers (assumed to be 24 cubic yards). The intermodal containers will then be transferred to flatbed trucks and transported via roadway to a nearby rail spur (assumed to be in the Ottawa area). The intermodal containers will then be transferred to flatbed rail cars, using a crane, and be transported via rail to the Envirocare Landfill in Clive, Utah. This option is assumed to be cost-effective for sites where moderate to large amount of material requires transportation and where transportation via rail is available. This option assumes that a staging area, similar to the one required in Option 6 is not available. Quantity listed assumes a 20% swell factor.
Overburden Material (Special Waste)	26,100	CY	$20	$522,000	$1,971,000	Assumes transportation to the special waste landfill in Batavia, Illinois. Transportation will be accomplished using covered dump-trucks via roadway. Quantity listed assumes a 20% swell factor.
OFF-SITE DISPOSAL						
Radium-contaminated Soil	6,900	CY	$135	$931,500		Cost assumes radium-contaminated soil will be disposed at the Envirocare Landfill in Clive, Utah. The unit price listed assumes that the project will negotiate a disposal rate equivalent to the standard Army Corps rate used at Envirocare. If this rate can not be negotiated, the unit cost for disposal of radium-contaminated soil will increase significantly.
Overburden Material (Special Waste)	26,100	CY	$35	$913,500		Cost assumes overburden material will be classified as special waste and disposed at Settlers Hill Landfill in Batavia, Illinois.
Groundwater	260,000	GAL	$0.05	$13,000	$1,858,000	Assumes the groundwater will be disposed of at the City of Ottawa wastewater treatment plant.

Table 2-14

PERCHED WATER MANAGEMENT	260,000	GAL	$0.35	$91,000		Assumes typical groundwater extraction methods will be used, i.e. well-point system or sumps. Cost includes collection of water, pumping to storage tanks, filtering of water, transfer of water from on-site storage tanks to transportation vehicles for dis
					$91,000	
SITE RESTORATION						Assumes borrow source is within 5 miles of the site. No compaction factor is applied to the quantity listed.
Backfill	27,500	CY	$20	$550,000		Cost assumes revegetation includes topsoil and hydroseeding.
Revegetation	4	Acre	$2,500	$10,000		Revegetation includes topsoil and hydroseeding.
					$560,000	
DIRECT COST SUBTOTAL					$7,737,500	
INDIRECT COSTS						
ENGINEERING/DESIGN/INVESTIGATION						
Engineering and Design	1	EST	$100,000	$100,000		
					$100,000	
CONTRACTOR PROCUREMENTS (@ 1% of direct costs)	1	EST	$77,400	$77,400		Cost is assumed to be $100,000
					$77,400	
CONSTRUCTION MANAGEMENT						
Resident Engineer	2,200	HR	$75	$165,000		This cost is based on one on-site engineer, working approximately 10 hours per day, or 50 hours per week.
Health & Safety Monitoring	2,200	HR	$75	$165,000		This cost is based on one on-site health physicist, working approximately 10 hours per day, or 50 hours per week.
Admin/Office Support (@ 10% of construction management labor)	1	EST	$33,000	$33,000		Cost is assumed to be approximately 10% of the labor costs listed above.
Per Diem	440	DAY	$85	$37,400		Cost assumes a lodging rate of $55 per day and a M&IE of $30 per day - for Resident Engineer and Health Physicist.
Car Rental	440	DAY	$65	$28,600		Cost assumes one rental car will be required for each person on-site.
Surveying	1	EST	$15,000	$15,000		Cost is based on the size of the site and the area where a survey is required.
Post-Construction Documentation and Certification	1	EST	$50,000	$50,000		This cost is based on the amount of effort required to provide post-construction documentation and certification.
QA/QC Testing	1	EST	$25,000	$25,000		This cost is based on the amount of effort required to collect and analyze QA/QC samples to ensure that the radium-226 contamination has been removed.
Site Security	44	WK	$2,000	$88,000		Potential security options include security personnel and temporary security fencing.
					$607,000	
INDIRECT COST SUBTOTAL					$784,400	
ANNUAL OPERATIONS AND MAINTENANCE (O&M) COSTS						
ANNUAL O&M COST SUBTOTAL					$0	
SUB-TOTAL of DIRECT AND INDIRECT COSTS					$8,521,900	
SUB-TOTAL of DIRECT AND INDIRECT COSTS WITH 25% CONTINGENCY					$10,652,000	
SUB-TOTAL of O&M COSTS					$0	
SUB-TOTAL of O&M COSTS WITH 25% CONTINGENCY					$0	
PRESENT WORTH of O&M COSTS WITH CONTINGENCY					$0	Assumes an interest factor of 7 % and an O&M period of 30 years.
TOTAL COST (DIRECT COSTS + INDIRECT COSTS + PRESENT WORTH COSTS) WITH CONTINGENCY					**$10,650,000**	

Table 2-15

ALTERNATIVE 4b
Soil Excavation to a Depth of 10 Feet, Perched Water Collection, and Off-Site Disposal
Generic Site - Ottawa Radiation Areas
Ottawa, Illinois

	ENGINEER'S ESTIMATES					COMMENTS
	Quantity	Unit	Unit Price	Cost	Subtotal	
DIRECT COSTS						Duration of project was calculated based on the assumed production rate of 1,125 cubic yards per week
MOBILIZATION/DEMOBILIZATION	1	EST	$25,000	$25,000	$25,000	Cost is based on the amount of equipment required to implement this alternative
SITE PREPARATION						
Clearing an[illegible] building	4	Acre	$3,000	$12,000		Cost assumes shoring and grubbing will be done in an area where a minimal amount of structure demolition is required. Cost assumes that debris found concrete can be decontaminated and will be disposed at a facility licensed to accept general construction waste. The cost includes, but is not limited to, personnel, equipment, transportation, and disposal
Offsite Disposal of Debris	100	CY	$60	$6,000		
Access Improvements	1	EST	$25,000	$25,000		Cost is based on the type of access improvements required to implement this alternative. Access improvements include construction of temporary roads, and supplying the site with the required utilities
Temporary Facilities	20	WK	$1,500	$30,000	$67,000	Cost assumes that temporary facilities include rental trailer, restroom facilities, chemical restroom, phone, port-a-can, and a decontamination station
EXCAVATION						
Excavation Contaminated Soil	5,000	CY	$5	$25,000		Excavation quantities are estimated as in-situ volume. The quantity specified includes a 25% excavation swell factor. The excavation swell factor is based on a conceptual excavation plan
Overburden Material	13,000	CY	$5	$65,000	$65,000	Excavation quantities are estimated as in-situ volume. The quantity specified includes a 25% excavation swell factor. The excavation swell factor is based on a conceptual excavation plan
ON-SITE LABORATORY	20	WK	$2,500	$35,000	$35,000	Assumes an on-site laboratory will be utilized for confirmation and disposal preparation sampling
WASTE PILE AREA						
Waste Pile Area	7,150	SF	$10	$71,500		Cost includes pad construction, including: asphalt, earthwork, and ramps, as described in Section 4 of the Generic FS text
Pre-Fabricated Building	1	EST	$50,000	$50,000	$121,500	Cost is based on pre-fabricated building, 1st Gen SOS and roof storage
OFF-SITE TRANSPORTATION						
Radium-contaminated Soil - TSD Option C	6,500	CY	$210	$1,365,000		This option assumes that soil will be loaded into intermodal containers estimated to be 24 cubic yards. The intermodal containers will then be transferred to flatbed trucks and transported via roadway to a nearby railroad consumed to be in the 100-year area. The intermodal containers will then be transferred to flatbed rail cars, using a crane, and be transported via rail to the Envirocare Landfill in Clive, Utah. This option is assumed to be cost-effective for sites where moderate to large amount of material requires transportation and where transportation via rail is available. This option assumes that a staging area, similar to the one required in Option 6, is not available. Quantity listed assumes a 20% swell factor
Overburden Material - Special Waste	16,400	CY	$20	$328,000	$1,693,000	Assumes transportation to the special waste landfill in Peterson, Illinois. Transportation will be via unpalleted, using covered dump trucks via roadway. Quantity listed assumes a 20% swell factor
OFF-SITE DISPOSAL						
Radium-contaminated Soil	6,500	CY	$145	$677,000		Cost assumes radium-soil mixture and will be disposed at the Envirocare Landfill in Clive, Utah. The unit price listed assumes that the project will negotiate a disposal rate super-sized to the standard Area Corporate used at Envirocare. If this rate can not be negotiated, the unit cost for disposal of radium-contaminated soil will increase significantly
Overburden Material - Special Waste	16,400	CY	$15	$574,000		Cost assumes overburden material will be classified as special waste and disposed at Settlers Hill Landfill in Peterson, Illinois
Groundwater	10,000	GAL	$0.05	$500	$1,252,000	Assumes the groundwater will be disposed of at the City of Ottawa wastewater treatment plant
PERCHED WATER MANAGEMENT	10,000	GAL	$0.15	$1,500	$1,500	Assumes typical groundwater extraction methods will be used, i.e. well-point system or sumps. Cost includes collection of water, pumping to storage tanks, filtering of water, transfer of water from on-site storage tanks to transportation vehicles for disposal, and transportation to the point of discharge/disposal
SITE RESTORATION						
Backfill	19,970	CY	$20	$331,400		Assumes borrow source is within 5 miles of the site. No compaction factor is applied to the quantity listed
Revegetation	4	Acre	$2,500	$10,000	$101,400	Cost assumes revegetation includes topsoil and hydroseeding
DIRECT COST SUBTOTAL					$4,004,750	
INDIRECT COSTS						
ENGINEERING/DESIGN/INVESTIGATION						
Engineering and Design	1	EST	$100,000	$100,000	$100,000	
CONTRACTOR PROCUREMENT (@ 1% of direct costs)	1	EST	$40,048	$40,048	$40,048	Cost is assumed to be $10,000
CONSTRUCTION MANAGEMENT						
Resident Engineer	1,000	HR	$75	$75,000		This cost is based on one on-site engineer, working approximately 10 hours per day, or 50 hours per week
Health & Safety Monitoring	1,000	HR	$75	$75,000		This cost is based on one on-site health physicist, working approximately 10 hours per day, or 50 hours per week
Admin Office Support (@ 10% of construction management labor)	1	EST	$15,000	$15,000		Cost is assumed to be approximately 10% of the labor costs listed above
Per Diem	200	DAY	$85	$17,000		Cost assumes a lodging rate of $55 per day and a M&IE of $30 per day - for Residential Engineer and Health Physicist
Car Rental	200	DAY	$65	$13,000		Cost assumes one rental car will be required for each person on-site
Surveying	1	EST	$15,000	$15,000		Cost is based on the size of the site and the area where a survey is required
Post-Construction Documentation and Certification	1	EST	$50,000	$50,000		This cost is based on the amount of effort required to provide post-construction documentation and certification
QA/QC Testing	1	EST	$25,000	$25,000		This cost is based on the amount of effort required to collect and analyze QA/QC samples to ensure that the radium-226 concentration has been removed
Site Security	20	WK	$2,000	$40,000	$125,000	Potential security options include security personnel and temporary security fencing
INDIRECT COST SUBTOTAL					$465,048	
ANNUAL OPERATIONS AND MAINTENANCE (O&M) COSTS						
ANNUAL GROUNDWATER MONITORING						
ANALYTICAL COSTS						Assumes that some of the organic compounds (SVOCs), metals, and radium-226 analyses are required
SVOCs	6	Samples	$400	$2,400		6 monitoring wells. The number of samples includes QA/QC samples. Assumes one sampling event per year
Metals	6	Samples	$200	$1,200		6 monitoring wells. The number of samples includes QA/QC samples. Assumes one sampling event per year
Radium	6	Samples	$400	$1,200	$4,800	6 monitoring wells. The number of samples includes QA/QC samples. Assumes one sampling event per year
SAMPLING LABOR AND SUPPLIES						
Engineer	20	HR	$75	$1,500		Cost assumes 10 hours per day, sampling is estimated to take 2 days
Geologist	20	HR	$75	$1,500		Cost assumes 10 hours per day, sampling is estimated to take 2 days
Per Diem	2	DAY	$85	$170		Cost assumes a lodging rate of $55 per day and a M&IE of $30 per day
Car Rental	4	DAY	$65	$260		Cost assumes one rental car will be required for each person on-site
Shipping	1	EST	$250	$250		Cost assumes a fixed cost per sampling event. This cost would be dependent on the total weight to be shipped and the shipping destination. The total weight to be shipped depends on the number of samples collected. The shipping destination depends on the laboratory procured to complete the analysis of the samples
Equipment Supplies	1	EST	$400	$200	$4,300	The cost of equipment and supplies would depend on the number of samples to be collected, the depth of the wells where the samples will be collected, and the duration of the sampling event
ANNUAL O&M COST SUBTOTAL					$11,200	
FIVE YEAR REVIEW	1	Review	$20,000	$20,000	$20,000	
FIVE-YEAR REVIEW COST SUBTOTAL					$20,000	
SUB-TOTAL of DIRECT AND INDIRECT COSTS					$4,469,798	
SUB-TOTAL of DIRECT AND INDIRECT COSTS WITH 25% CONTINGENCY					$5,587,000	
SUB-TOTAL of O&M COSTS					$11,200	
SUB-TOTAL of O&M COSTS WITH 25% CONTINGENCY					$14,000	
SUB-TOTAL of FIVE-YEAR REVIEW COSTS					$20,000	
SUB-TOTAL of FIVE-YEAR REVIEW COSTS WITH 25% CONTINGENCY					$25,000	
PRESENT WORTH of O&M COSTS WITH CONTINGENCY					$174,000	Assumes an interest factor of 7% and an O&M period of 30 years
PRESENT WORTH of FIVE-YEAR REVIEW COSTS WITH CONTINGENCY					$54,000	Assumes an interest factor of 7% and 6 five-year review periods
TOTAL COST (DIRECT COSTS + INDIRECT COSTS + PRESENT WORTH COSTS) WITH CONTINGENCY					**$5,820,000**	

Table 2-16

ALTERNATIVE 5b
Soil Excavation to a Depth of 10 Feet, Perched Water Collection, Volume Reduction, and Off-Site Disposal
Generic Site - Ottawa Radiation Areas
Ottawa, Illinois

	ENGINEER'S ESTIMATES					COMMENTS
	Quantity	Unit	Unit Price	Cost	Subtotal	
DIRECT COSTS						Duration of project was calculated based on the estimated production rate of 2*** cubic yards per week
MOBILIZATION/DEMOBILIZATION	1	EST	$25,***	$25,***		Cost is based on the amount of equipment required to implement this alternative
					$25,***	
SITE PREPARATION						
Clearing and Grubbing	4	Acre	$3,***	$12,***		Cost assumes clearing and grubbing will be done in an area where a minimal amount of moderate tree removal is required. Cost assumes that a debris-lined on-site cell will be decommissioned and will be designed as a facility required to accept general construction waste. The cost includes decommissioning, screening for radioactive release criteria, transportation, and disposal
Off-site Disposal of Debris	200	CY	$60	$0,000		
Access Improvements	1	EST	$25,***	$25,000		Cost is based on the type of access improvements required to implement this alternative. Access improvements include construction of temporary roadways and improving the site with the required utilities
Temporary Facilities	91	WK	$1,5**	$**,500		Cost is estimated at temporary facilities include rental trailer, restroom facilities, electrical service, phone service, water, dependence, clean-up
					$88,5**	
EXCAVATION						
Radium-Contaminated Soil	3,14*	CY	$5	$15,7**		Excavation quantities are estimated to in-situ volume. The quantity specified includes a 2*% over-excavation factor. Thus over-excavation factor is based on a conceptual excavation plan
Overburden Material	15,9**	CY	$5	$79,5**		Excavation quantities are estimated to in-situ volume. The quantity specified includes a 2*% over-excavation factor. Thus over-excavation factor is based on a conceptual excavation plan
					$95,3**	
ON-SITE LABORATORY	91	WK	$7,5**	$252,5**		Assumes an on-site laboratory will be utilized for confirmation and disposal parameter sampling
					$252,5**	
WASTE PILE AREA						
Waste Pile Area	8,1**	SF	$10	$81,***		Cost assumes pad construction includes asphalt curbs and sumps, as described in Section 4 of the Generic FS text
Pre-fabricated Building	1	EST	$100,***	$100,***		Cost is based on per fabricated buildings for the Skids and tool storage
					$181,***	
SEGMENTED GATE SYSTEM	22,9**	CY	$75	$1,717,5**		Unit cost includes cost for mobilization, assembly, calibration operation, disassembly and demobilization. Assumes a 20*% swell factor
					$1,717,5**	
OFF-SITE TRANSPORTATION						
Radium-contaminated Soil - T&D Option 5	3,8**	CY	$210	$798,***		This option assumes that soil will be loaded into intermodal containers (assumed to be 24 cubic yards). The intermodal containers will then be transferred to flatbed trucks and transported via roadway to a nearby rail spur (assumed to be in the Ottawa area). The intermodal containers will then be transferred to flatbed rail cars, using a crane, and be transported via rail to the Envirocare Landfill in Clive, Utah. This option is assumed to be cost-effective for sites where moderate to large amounts of material require transportation and where transportation via rail is available. This option assumes that a staging area similar to the one required in Option 6 is not available. Quantity listed assumes a 20*% swell factor
Overburden Material (Special Waste)	19,1**	CY	$20	$382,***		Assumes transportation to the special waste landfill in Bolivar, Illinois. Transportation will be accomplished using covered dump trucks via roadway. Quantity listed assumes a 20*% swell factor
					$1,180,***	
OFF-SITE DISPOSAL						
Radium-contaminated Soil	3,8**	CY	$135	$513,***		Cost assumes radium-contaminated soil will be disposed at the Envirocare Landfill in Clive, Utah. The unit price listed assumes that the project will negotiate a disposal rate equivalent to the standard Army Corps rate used at Envirocare. If this rate can not be negotiated, the unit cost for disposal of radium-contaminated soil will increase significantly.
Overburden Material (Special Waste)	19,1**	CY	$35	$668,5**		Cost assumes overburden material will be classified as special waste and disposed at Settlers Hill Landfill in Bolivar, Illinois
Groundwater	16,***	GAL	$0.05	$5**		Assumes the groundwater will be disposed of at the City of Ottawa's wastewater treatment plant
					$1,182,***	
PERCHED WATER MANAGEMENT	10,***	GAL	$0.35	$3,5**		Assumes typical groundwater extraction methods will be used, i.e. well point system or sumps. Cost includes collection of water, pumping to storage tanks, filtering of water, transfer of water from on-site storage tanks to transportation vehicles/ships
					$3,5**	
SITE RESTORATION						Assumes borrow source is within 5 miles of the site. No compaction factor is applied to the quantity listed
Backfill	19,67*	CY	$20	$381,4**		Cost assumes revegetation includes topsoil and hydroseeding
Revegetation	4	Acre	$2,5**	$10,***		Revegetation includes topsoil and hydroseeding
					$391,***	
DIRECT COST SUBTOTAL					$5,097,750	
INDIRECT COSTS						
ENGINEERING/DESIGN/INVESTIGATION						
Engineering and Design	1	EST	$100,***	$100,***		
					$100,***	
CONTRACTOR PROCUREMENTS (@ 1% of direct costs)	1	EST	$50,978	$50,978		Cost is assumed to be $100,000
					$50,978	
CONSTRUCTION MANAGEMENT						
Resident Engineer	1,550	HR	$75	$116,250		This cost is based on one on-site engineer, working approximately 10 hours per day, or 50 hours per week
Health & Safety Monitoring	1,550	HR	$75	$116,250		This cost is based on one on-site health physicist, working approximately 10 hours per day, or 50 hours per week
Admin Office Support (@ 10*% of construction management labor)	1	EST	$23,250	$23,250		Cost is assumed to be approximately 10*% of the labor costs listed above
Per Diem	310	DAY	$85	$26,350		Cost assumes a lodging rate of $55 per day and a M&IE of $30 per day for Resident Engineer and Health Physicist
Car Rental	310	DAY	$65	$20,150		Cost assumes one rental car will be required for each person on-site
Surveying	1	EST	$15,***	$15,***		Cost is based on the size of the site and the area where a survey is required
Post-Construction Documentation and Certification	1	EST	$50,***	$50,***		This cost is based on the amount of effort required to prepare post-construction documentation and certification
QA/QC Testing	1	EST	$25,***	$25,***		This cost is based on the amount of effort required to collect and analyze QA/QC samples to ensure that the radium-226 contamination has been removed
Site Security	91	WK	$2,***	$82,***		Potential security options include security personnel and temporary security fencing
					$454,250	
INDIRECT COST SUBTOTAL					$605,228	
ANNUAL OPERATIONS AND MAINTENANCE (O&M) COSTS						
ANNUAL GROUNDWATER MONITORING						
ANALYTICAL COSTS						Assumes that semi-volatile organic compounds (SVOCs), metals, and radium-226 analysis are required
SVOC	5	Samples	$5**	$2,***		6 monitoring wells. The number of samples includes QA/QC samples. Assumes one sampling event per year
Metals	8	Samples	$2**	$1,***		6 monitoring wells. The number of samples includes QA/QC samples. Assumes one sampling event per year
Radium	8	Samples	$4**	$3,2**		6 monitoring wells. The number of samples includes QA/QC samples. Assumes one sampling event per year
					$7,2**	
SAMPLING LABOR AND SUPPLIES						
Engineer	20	HR	$75	$1,5**		Cost assumes 10 hours per day, sampling is estimated to take 2 days
Geologist	20	HR	$75	$1,5**		Cost assumes 10 hours per day, sampling is estimated to take 2 days
Per Diem	2	DAY	$85	$170		Cost assumes a lodging rate of $55 per day and a M&IE of $30 per day
Car Rental	4	DAY	$65	$26*		Cost assumes one rental car will be required for each person on-site
Shipping	1	EST	$25*	$25*		Cost assumes a fixed cost per sampling event. This cost would be dependent on the total weight to be shipped and the shipping destination. The total weight to be shipped depends on the number of samples collected. The shipping destination depends on the laboratory procured to complete the analysis of the samples
Equipment/Supplies	1	EST	$4**	$4**		The cost of equipment and supplies would depend on the number of samples to be collected, the depth of the well, where the samples would be collected, and the duration of the sampling event
					$4,0**	
ANNUAL O&M COST SUBTOTAL					$11,2**	
FIVE YEAR REVIEW	1	5-year	$20,***	$20,***		
					$20,***	
FIVE-YEAR REVIEW COST SUBTOTAL					$20,000	
SUB-TOTAL of DIRECT AND INDIRECT COSTS					$5,097,750	
SUB-TOTAL of DIRECT AND INDIRECT COSTS WITH 25% CONTINGENCY					$6,372,000	
SUB-TOTAL of O&M COSTS					$11,280	
SUB-TOTAL of O&M COSTS WITH 25% CONTINGENCY					$14,000	
SUB-TOTAL of FIVE-YEAR REVIEW COSTS					$20,000	
SUB-TOTAL of FIVE-YEAR REVIEW COSTS WITH 25% CONTINGENCY					$25,000	
PRESENT WORTH of O&M COSTS WITH CONTINGENCY					$174,000	Assumes an interest factor of 7*% and an O&M period of 30 years
PRESENT WORTH of FIVE-YEAR REVIEW COSTS WITH CONTINGENCY					$54,000	Assumes an interest factor of 7*% and 6 five-year review periods
TOTAL COST (DIRECT COSTS + INDIRECT COSTS + PRESENT WORTH COSTS) WITH CONTINGENCY					**$6,600,000**	

Table 2-17

ARARs for Ottawa Radiation Areas: NPL-8 Frontage Property and Presumed Remedy for Residential Areas including NPL-11 Ottawa, Illinois

ARARS	REQUIREMENTS	Residential Areas including NPL-11 (Alternative 2)	NPL-8 Frontage Property (Alternative 4b)
FEDERAL ARARS			
Sec 275 of the Atomic Energy Act (42 USC 2022), as amended by Sec 206 of the Uranium Mill Tailings Radiation Control Act (42 USC 7918)			
Standards for the Stabilization, Disposal, and Control of Uranium and Thorium Mill Tailings (40 C.F.R. § 192.12(a) & 40 C.F.R. § 192.21)	Subpart B of 40 C.F.R. § 192.12 (a) contains two different standards. The surface soil standard (5 pCi/g radium-226 above background) is not applicable but is a relevant and appropriate health-based standard to the frontage property of NPL 8 and to residential areas including NPL 11. The subsurface soil standard is not an ARAR for either the frontage property of NPL 8 or the residential areas including NPL-11. (See discussion in Section 2.13.2) The supplemental standards of 40 C.F.R. § 192.21 are relevant and appropriate to the subsurface materials at the NPL-8 Frontage Property. (See discussion in Section 2.13.2)	Y	Y
Federal Water Pollution Control Act as Amended by the Clean Water Act (CWA)			
Sections 301 and 303 of the CWA	Perched groundwater (if any) will be treated and discharged to the City of Ottawa publicly owned treatment works (POTW) or to a surface water body, such as, the Fox River or Goose Creek. If there is a discharge to a surface water body, the discharge must meet the Illinois water quality standards applicable to the surface water body that have been developed pursuant to CWA Section 303 and technology based standards developed pursuant to CWA Section 301(b). See Illinois Water Quality Standards (35 IAC Part 302) and Effluent Standards (35 IAC Part 304) below).	Y	Y
40 C.F.R. § 403	If the treated perched water is discharged to the POTW, the treated water must meet the approved State pretreatment standards developed pursuant to 40 C.F.R. § 403. (See Illinois Sewer Discharge Criteria (35 IAC Part 307 and Pretreatment Programs 35 IAC Part 310).	Y	Y
Resource Conservation and Recovery Act (RCRA) (42 USC 6901 et seq.)			
RCRA	RCRA is not applicable because no known hazardous waste was disposed of at NPL-11 and NPL-8 Frontage Property after 1980. If testing of excavated material at residential areas, NPL-11 or NPL- 8 reveals that the material exhibits the characteristics of hazardous waste, RCRA requirements are applicable to the handling of these excavated materials.	Y	Y
Identification and Listing of Hazardous Waste (40 C.F.R. § 261)	Excavated materials will be tested to determine if it is RCRA characteristic waste.	Y	Y

Table 2-17

ARARs for Ottawa Radiation Areas: NPL-8 Frontage Property and Presumed Remedy for Residential Areas including NPL-11 Ottawa, Illinois (Continued)

ARARS	REQUIREMENTS	Residential Areas including NPL-11 (Alternative 2)	NPL-8 Frontage Property (Alternative 4b)
Transportation of Hazardous Waste (40 C.F.R § 263)	Any excavated material that exhibits the characteristic of hazardous waste will be transported in compliance with 40 C.F.R § 263.	Y	y
Containers (40 C.F.R §§ 264.171 through 264.178)	Any storage of excavated material that exhibits the characteristic of hazardous waste will meet requirements under 40 C.F.R §§ 264.171 to 264.178 (Subpart I).	Y	Y
Tanks (40 C.F.R §§ 264.191 through 264.198)	Any storage in tanks of excavated material that exhibits the characteristic of hazardous waste will meet the regulations under 40 C.F.R §§ 264.191 to 264.198 (Subpart J).	Y	Y
Waste Piles (40 C.F.R §§ 264.251 through 264.256)	Any storage in waste piles of excavated material that exhibits the characteristic of hazardous waste will meet the minimum technology requirements of 40 C.F.R §§ 264.251 through 264.256)	Y	Y
Land Disposal Restrictions (LDDS) (40 C.F.R § 268)	If the excavated material tests RCRA characteristic then the material will be disposed of off-site and the disposal will be conducted in accordance with these requirements.	Y	Y
U.S. Department of Transportation (DOT) Regulations			
40 C.F.R §§ 170 through 179	Establishes requirements for off-site transportation of site-generated waste.	Y	Y
STATE ARARS			
Illinois Water Quality Standards (35 IAC Part 302)	If treated perched ground water is discharged to a surface water body, such as, the Fox River or Goose Creek, the Illinois water quality standards for surface water bodies will be applicable to this discharge.	Y	Y
Illinois Effluent Standards (35 IAC Part 304)	If treated perched ground water is discharged to a surface water body, the Illinois effluent standards will be applicable to this discharge.	Y	Y
Monitoring and Reporting Requirements (35 IAC Part 305)	Prescribes requirements for monitoring, reporting, and measuring containment discharges.	Y	Y
Sewer Discharge Criteria (35 IAC Part 307); Pretreatment Programs (35 IAC Part 310)	If the treated perched water is discharged to the POTW, the treated water must meet the Illinois Sewer Discharge criteria and pretreatment standards prior to discharge into the sewer system and POTW.	Y	Y

Table 2-17

ARARs for
Ottawa Radiation Areas: NPL-8 Frontage Property and Presumed Remedy for Residential Areas including NPL-11
Ottawa, Illinois
(Continued)

ARARS	REQUIREMENTS	Residential Areas including NPL-11 (Alternative 2)	NPL-8 Frontage Property (Alternative 4b)
Illinois Risk Based Cleanup Objectives - Tiered Approach to Corrective Action Objectives to Corrective Action Objectives (TACO) (35 IAC Part 742)	NPL 11 - Soil Sampling Results indicate that soil TACO standards are not exceeded. NPL 8 Frontage - The restrictive covenant is substantively similar to the ELUC required by TACO if contamination is left in place. Excavation to 10 bgs, backfill with clean material and restrictive covenant meet the substantive requirements of TACO. The 10 foot soil cover will meet TACO standards.	Y	Y
Identification and Listing of Hazardous Waste (35 IAC Part 721)	Excavated material will be tested to determine if it is RCRA characteristic hazardous waste.	Y	Y
Standards Applicable to Generators of Hazardous Wastes (35 IAC Parts 721 and 722)	If the excavated material is RCRA characteristic hazardous waste, the identification and manifesting and pre-transportation requirements for generators will apply.	Y	Y
Standards Applicable to Tank Systems (35 IAC Part 724, Subpart J)	Any storage in tanks of excavated material that exhibits the characteristic of hazardous waste must meet these regulations.	Y	Y
Standards Applicable to Waste Piles (35 IAC Part 724, Subpart L)	Any storage in waste piles of excavated material that exhibits the characteristic of hazardous waste must meet the minimum technology requirements of these regulations.	Y	Y
Transportation Standards (35 IAC Part 723)	Any excavated material that exhibits the characteristic of hazardous waste will be transported in compliance with these requirements.	Y	Y
Land Disposal Restrictions (35 IAC Part 728)	If the excavated material tests RCRA characteristic then the material will be disposed of off-site and the disposal will be conducted in accordance with these requirements. .	Y	Y

Y- Yes the ARAR will be met.

APPENDIX A

Responsiveness Summary

Appendix A
United States Environmental Protection Agency's Responsiveness Summary

The purpose of the Responsiveness Summary is to provide a summary of the United States Environmental Protection Agency's (U.S. EPA's) responses to the comments received from the public on the Proposed Plan and Administrative Record for the Ottawa Radiation Areas: a remedy for the Frontage Property to NPL-8 and a presumed remedy for radium contaminated soil in residential areas including NPL-11, Ottawa, LaSalle County, Illinois. This Proposed Plan was issued July 16, 2003. The public comment period for the Proposed Plan was established from July 18, 2003 to August 18, 2003. The public meeting was held July 30, 2003 at Ottawa's City Hall. The meeting was divided into two parts. In the first part of the meeting, U.S. EPA explained its proposed remedial actions and answered questions. In the second part of the meeting, U.S. EPA received formal public comments that are addressed in this responsiveness summary. The entire proceedings of the meeting were transcribed by a court reporter and are being included in the final Administrative Record.

U.S. EPA received two kinds of comments: 1) written comments received during the public comment period, and 2) formal oral comments received at the public meeting. U.S. EPA is required by law to consider and address only those comments that are pertinent and significant to the remedial action being selected. U.S. EPA is not required to address comments which pertain to the allocation of liability for the remedial action, nor potential enforcement action to implement the remedial action, as these are independent of the selection of the remedial action and U.S. EPA's Proposed Plan.

U.S. EPA is not required to re-print the comments of the commenter verbatim and may paraphrase where appropriate. In many cases in this response summary, U.S. EPA has included large segments of the original comment. However, persons wishing to see the full text of all comments should refer to the commenter's submittal to U.S. EPA which has been included in the Administrative Record.

Specific responses by U.S. EPA are indexed for convenient reference. Comments are shown in normal text and U.S. EPA's responses are shown in an italicized type style.

Ms. Swift: I cannot understand why the radium was not completely removed when they dug around the house on Bellevue Avenue (NPL-11) several years ago. According to what I heard and read, when the radium was removed, it was not properly disposed of. Why?

My greatest concern - will the radium be properly disposed of? My understanding - the last time they removed some of the radium contaminated soil on Bellevue Avenue it was not properly disposed of. It is scary. I am fortunate not to have any small children.

The northside neighbor watch program meets at the Lion's Club House, not far from where the radium was removed.

Response: *U.S. EPA conducted removal actions at 12 sites including NPL-11 from 1994*

to 1996. The radium contaminated soil that was excavated was containerized in intermodal boxes and transported for disposal at a licensed facility operated by Envirocare of Utah, Inc. in Clive, Utah. This facility is licensed to accept radioactive material. All of the contaminated soil was not removed from the vacant lot at NPL-11 because of the difficulties associated with reaching soil below the groundwater table.

U.S. EPA's future plans relating to disposal include: (1) soil with radium-226 concentrations greater than 6.2 picoCuries per gram (pCi/g) would be disposed of off-site at a licensed radioactive waste landfill, and (2) soil exhibiting radium-226 concentrations equal to or less than 6.2 pCi/g would be disposed of off-site at a licensed special waste landfill.

Mr. Jett: I would like to see all the water collected from that lot on Bellevue Avenue tanked in a tanker. I don't care how low the radium is in the water to be discharged to Goose Creek. I don't think it could be integrated. Why are you dumping this into Goose Creek?

Response: *The remedy includes the collection of perched groundwater that may accumulate during excavation, treatment by filtration and discharge either to Goose Creek or to the City of Ottawa wastewater treatment plant. U.S. EPA will discharge the water to Goose Creek only if it meets the federal and state water quality requirements. Based on the existing perched groundwater quality data from NPL-11, filtration should be sufficient to meet water quality and discharge requirements. However, the U.S. EPA understands your concern and will take it into consideration during the design phase of the project.*

APPENDIX B

Administrative Record

U.S. ENVIRONMENTAL PROTECTION AGENCY

ADMINISTRATIVE RECORD
FOR
OTTAWA RADIATION AREAS SUPERFUND SITE
OTTAWA, LASALLE COUNTY, ILLINOIS

UPDATE #5
FEBRUARY 3, 2000

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	00/00/00	Muno, W., U.S. EPA	Ryan, J., Office of Illinois Attorney	Letter re: U.S. EPA's General Notice of Potential Liability and 104(e) Information Request for the Ottawa Radiation NPL-8 Site w/Attachments	3
2	00/00/00	Muno, W., U.S. EPA	Manning, B., Illinois Department of Natural Resources	Letter re: U.S. EPA's General Notice of Potential Liability and 104(e) Information Request for the Ottawa Radiation NPL-8 Site w/Attachments	14
3	11/00/96	Roy F. Weston, Inc.	U.S. EPA	Quality Assurance Project Plan for the Ottawa Radiation Areas Site; Volume 1 (Text, Tables, Figures and Appendices A-C)	300
4	12/13/96	Roy F. Weston, Inc.	U.S. EPA	Letter re: Revision 4 to the Addendum for the Quality Assurance Project Plan and Field Sampling Plan for the Ottawa Radiation Areas Site w/Attached Revisions	16
5	09/03/97	Rogers, R., Illinois EPA	Mankowski, M., U.S. EPA	Letter re: State of Illinois ARARs for the Ottawa Radiation Areas w/Attached Letter to Weston Forwarding ARARs Table	12
6	11/00/97	Roy F. Weston, Inc.	U.S. EPA	Amended Quality Assurance Project Plan for the Ottawa Radiation Areas NPL-1, NPL-4, and NPL-9: Volume 1 (Text, Tables, Figures and Appendices A-F)	360

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
7	01/00/98	Roy F. Weston, Inc.	U.S. EPA	Alternatives Array Document for the Ottawa Radiation Areas Site Conservation Area (NPL-8)	191
8	04/00/98	Roy F. Weston, Inc.	U.S. EPA	Technical Memorandum: Supplemental Risk Assessment: Future Commercial/ Industrial Land Use for the Ottawa Radiation Conservation Area NPL-8 Site	59
9	04/00/98	Roy F. Weston, Inc.	U.S. EPA	Technical Memorandum: Human Health Risk-Based Soil Cleanup Levels for the Ottawa Radiation Conservation Area NPL-8 Site	24
10	04/00/98	Roy F. Weston, Inc.	U.S. EPA	Remedial Investigation Report for the Conservation Area (NPL-8) Site	456
11	07/24/98	Means, B., National Remedy Review Board	Muno, W., U.S. EPA	Memorandum re: NRRB's Recommendations for the Ottawa Radiation Superfund Site	3
12	08/28/98	Manning, B., Illinois Department of Natural Resources	Muno, W., U.S. EPA	Letter re: IDNR's Response to U.S. EPA's 104(e) Information Request for the Ottawa Radiation NPL-8 Site	132
13	09/04/98	Manning, B., Illinois Department of Natural Resources	Muno, W., U.S. EPA	Letter re: Fox River State Park at the Ottawa Radiation NPL-8 Site	2
14	09/00/98	Roy F. Weston, Inc.	U.S. EPA	Risk Assessment Report for the Conservation Area (NPL-8) Site	335
15	11/12/98	Carney, W., U.S. EPA	Buck, F., City of Ottawa	Letter re: U.S. EPA's 104(e) Information Request for the Ottawa Radiation NPL-8 Site w/Attachments	14

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
16	12/00/98	Muno, W., U.S. EPA	Appel, G., Illinois Department of Nuclear Safety	Letter re: U.S. EPA's Request for Illinois ARARs for the Ottawa Radiation NPL-8 Site	2
17	01/20/99	Carney, W., U.S. EPA	Luminous Processes, Inc., et al.	Letter re: U.S. EPA's 104(e) Information Request for the Ottawa Radiation NPL-8 Site w/Attachments	16
18	01/28/99	Yonkauski, S., Illinois Department of Natural Resources	Appel, G., Illinois Department of Nuclear Safety	Memorandum re: ARARs for the Ottawa Radiation Areas	3
19	01/00/99	Roy F. Weston Inc.	U.S. EPA	Site Characterization Report for the Ottawa Radiation NPL-1 Site	296
20	01/29/99	Ortciger, T., Illinois Department of Nuclear Safety	Muno, W., U.S. EPA	Letter re: IDNS Response to U.S. EPA's Request for Illinois ARARs for the Ottawa Radiation NPL-8 Site	4
21	01/29/99	Leigh, K., City of Ottawa	Cuffman, C., U.S. EPA	Letter re: City of Ottawa's Request for Information for the Ottawa Radiation NPL-8 Site	3
22	02/24/99	Muno, W., U.S. EPA	Appel, G., Illinois Department of Nuclear Safety	Letter re: U.S. EPA's Request for Illinois ARARs for the Ottawa Radiation NPL-1, NPL-4 and NPL-9 Sites	2
23	03/00/99	Roy F. Weston Inc.	U.S. EPA	Site Characterization Report for the Ottawa Radiation NPL-4 Site	318
24	03/00/99	Roy F. Weston Inc.	U.S. EPA	Site Characterization Report for the Ottawa Radiation NPL-9 Site	284
25	03/00/99	Roy F. Weston Inc.	U.S. EPA	Site Characterization Report for Non-Time Critical Removal Support for the Illinois Power Site	97

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
26	03/12/99	Ortciger, T., Illinois Department of Nuclear Safety	Muno, W., U.S. EPA	Letter re: IDNS Response to U.S. EPA's Request for Illinois ARARs for the Ottawa Radiation NPL-1, NPL-4 and NPL-9 Sites	4
27	04/00/99	Roy F. Weston Inc.	U.S. EPA	Risk Assessment Report for the Illinois Power Site	115
28	04/06/99	Rogers, R., Illinois EPA	Mankowski, M., U.S. EPA	Letter re: ARARs for the Ottawa Radiation NPL-1, NPL-4 and NPL-9 Sites	1
29	06/00/99	Roy F. Weston, Inc.	U.S. EPA	Site Characterization Report for the Ottawa Radiation NPL-1 Site	310
30	06/00/99	Roy F. Weston Inc.	U.S. EPA	Risk Assessment Report for the Illinois Power Site	117
31	06/00/99	Roy F. Weston, Inc.	U.S. EPA	Site Characterization Report for the Ottawa Radiation NPL-9 Site	284
32	06/00/99	Roy F. Weston, Inc.	U.S. EPA	Site Characterization Report for Non-Time Critical Removal Support Illinois Power Site	100
33	06/07/99	Muno, W., U.S. EPA	Ortciger, T., Illinois Department of Nuclear Safety	Letter re: U.S. EPA's Review of Illinois ARARs for the Ottawa Radiation NPL-1, NPL-4, NPL-8 and NPL-9 Sites	2
34	06/07/99	Tindall, K., U.S. EPA	Rowe, R., Marseilles IL, Resident	Letter re: U.S. EPA's 104(e) Information Request for the Ottawa Radiation NPL-8 Site w/Attachments	14
35	06/09/99	Muno, W., U.S. EPA	Means, B., National Remedy Review Board	Memorandum re: U.S. EPA's Response to the NRRB's Recommendations on the Ottawa Radiation Areas, NPL-8, Superfund Site	6
36	07/00/99	Roy F. Weston, Inc.	U.S. EPA	Site Characterization Report for the Ottawa Radiation NPL-4 Site	309

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
37	07/00/99	Roy F. Weston, Inc.	U.S. EPA	Engineering Evaluation/ Cost Analysis Report for Non-Time Critical Removal Support for the Ottawa Radiation NPL-4 Site	215
38	07/00/99	Roy F. Weston, Inc.	U.S. EPA	Engineering Evaluation/ Cost Analysis Report for Non-Time Critical Removal Support for the Ottawa Radiation NPL-9 Site	219
39	07/00/99	Roy F. Weston, Inc.	U.S. EPA	Engineering Evaluation/ Cost Analysis Report for the Ottawa Radiation NPL-1 Site	237
40	07/00/99	Roy F. Weston, Inc.	U.S. EPA	Feasibility Study Report for the Ottawa Radiation NPL-8 Site	320
41	08/00/99	Roy F. Weston Inc.	U.S. EPA	Engineering Evaluation/ Cost Analysis Report for the Ottawa Radiation NPL-1 Site	215
42	08/00/99	Roy F. Weston, Inc.	U.S. EPA	Risk Assessment Report for the Ottawa Radiation NPL-1 Site	216
43	08/31/99	Roy F. Weston, Inc.	U.S. EPA	Engineering Evaluation/ Cost Analysis Report for Non-Time Critical Removal Support for the Ottawa Radiation NPL-4 Site	212
44	08/31/99	Roy F. Weston, Inc.	U.S. EPA	Engineering Evaluation/ Cost Analysis Report for Non-Time Critical Removal Support for the Ottawa Radiation NPL-9 Site	193
45	08/31/99	Roy F. Weston, Inc.	U.S. EPA	Engineering Analysis Report NPL-1 Site for the Ottawa Radiation Areas	216
46	10/00/99	Roy F. Weston, Inc.	U.S. EPA	Risk Assessment Report for the Ottawa Radiation NPL-1 Site	405
47	10/00/99	Roy F. Weston, Inc.	U.S. EPA	Risk Assessment Report for the Ottawa Radiation NPL-2 Site	143

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
48	10/00/99	Roy F. Weston, Inc.	U.S. EPA	Risk Assessment Report for the Ottawa Radiation NPL-4 Site	311
49	10/00/99	Roy F. Weston, Inc.	U.S. EPA	Risk Assessment Report for the Ottawa Radiation NPL-9 Site	270
50	10/00/99	Roy F. Weston, Inc.	U.S. EPA	Risk Assessment Report for the Ottawa Radiation NPL-11 Site	172
51	10/00/99	Roy F. Weston, Inc.	U.S. EPA	Risk Assessment Report for the Illinois Power Site	129

U.S. ENVIRONMENTAL PROTECTION AGENCY

ADMINISTRATIVE RECORD
FOR
OTTAWA RADIATION AREAS SUPERFUND SITE
OTTAWA, LASALLE COUNTY, ILLINOIS

UPDATE #6
FEBRUARY 10, 2000

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	02/00/00	U.S. EPA	Public	Proposed Plan for the Ottawa Radiation Areas--NPL-1,4,8 and 9 Superfund Sites	30

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
OTTAWA RADIATION AREAS SUPERFUND SITE
OTTAWA, LASALLE COUNTY, ILLINOIS

UPDATE #7
MAY 9, 2000

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	02/24/00	Siska, K., C.S.R.	U.S. EPA	Transcript: February 24, 2000 Proposed Plan Public Meeting for the Ottawa Radiation Areas NPL-1, 4, 8 and 9	51

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
OTTAWA RADIATION AREAS SUPERFUND SITE
OTTAWA, LASALLE COUNTY, ILLINOIS

UPDATE #8
AUGUST 4, 2000

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
	04/27/00	Ortciger, T., State of Illinois/ Department of Nuclear Safety	Lyons, F., U.S. EPA	Letter: IDNS' Comments on U.S EPA's Proposed Cleanup Plan for the Ottawa Radiation Areas NPL-1, 4, 8 and 9 Sites w/ Attached Exhibits 1-31	434
	04/27/00	Ryan, J. & M. Dunn; State of Illinois/ Office of the Attorney General	Lyons, F., U.S. EPA	Letter re: Attorney General's Comments on U.S. EPA's Proposed Plan for the Ottawa Radiation Sites NPL-1, 4, 8 and 9	2
	07/12/00	Mankowski, M., U.S. EPA	File	Memorandum re: Revised Page 3 of 19 for Table 4-3 of the Feasibility Study Report for NPL-8 at the Ottawa Radiation Areas Site	2

U.S. ENVIRONMENTAL PROTECTION AGENCY

ADMINISTRATIVE RECORD
FOR
OTTAWA RADIATION AREAS SUPERFUND SITE
OTTAWA, LASALLE COUNTY, ILLINOIS

UPDATE #9
SEPTEMBER 12, 2000

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	02/24/00	Eschbach, R., City of Ottawa	Mankowski, M., U.S. EPA	Letter re: City of Ottawa's Comments of on the Proposed Clean-up Plan for the Ottawa Radiation Areas NPL-1, 4, 8, 9 and Illinois Power Sites and Proposed Construction of Facilities in the Vicinity of the NPL-1, 4, 8 and IP Sites	5
2	03/07/00	Matejka, M., Laborers-Employers Cooperation and Education Trust	Kimbrough, D., U.S. EPA/ OPA	Letter re: LECET's Comments on the Proposed Clean-up Plan for the Ottawa Radiation Areas NPL-1, 4, 8, 9 and Illinois Power Sites	1
3	04/21/00	Concerned Citizens	U.S. EPA	Seven Public Comment Letters/Sheets/E-Mail re: the Proposed Clean-up Plan for the Ottawa Radiation Areas NPL-1, 4, 8, 9 and Illinois Power Sites Received February 28 - April 21, 2000	9
4	09/08/00	U.S. EPA	Public	Record of Decision with Responsiveness Summary for the Ottawa Radiation Areas NPL-1, 4, 8, 9 and Illinois Power Building Sites	147

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
OTTAWA RADIATION AREAS SUPERFUND SITE
OTTAWA, LASALLE COUNTY, ILLINOIS

UPDATE #10
OCTOBER 3, 2001

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	09/00/01	Roy F. Weston, Inc.	U.S. EPA	Predesign Investigation Report for the Ottawa Radiation Areas NPL-1 Site	249
2	09/00/01	Roy F. Weston, Inc.	U.S. EPA	Predesign Investigation Report for the Ottawa Radiation Areas NPL-4 Site	217
3	09/00/01	Roy F. Weston, Inc.	U.S. EPA	Predesign Investigation Report for the Ottawa Radiation Areas NPL-9 Site	306

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
OTTAWA RADIATION AREAS SITE
OTTAWA, LA SALLE COUNTY, ILLINOIS

UPDATE #11
JULY 11, 2003

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	10/15/99	Roy F. Weston, Inc.	U.S. EPA	Risk Assessment Report NPL-11 Site (Revision 2), Ottawa, Illinois	165
2	10/26/00	Roy F. Weston, Inc.	U.S. EPA	Site Characterization Report for NPL-11 Site, Ottawa, Illinois	90
3	09/10/02	Roy F. Weston, Inc.	U.S. EPA	Ottawa Radiation Areas-NPL-8 Amended Quality Assurance Project Plan And Field Sampling Plan, Ottawa, Illinois	94
4	09/30/02	Boone, D., U.S. EPA	Mehl, R., Weston Solutions, Inc.	Letter re: U.S. EPA's Approval of the Ottawa Radiation Areas NPL-8 Amended Quality Assurance Project Plan and Field Sampling Plan	1
5	12/14/02	Argonne National Laboratory	Boone, D., U.S. EPA	Ottawa Sample Data Package, Analytical Results from the Redesign Investigation Report, Ottawa Radiation Areas Rowe Property w/Cover Letter	642
6	03/07/03	Weston Solutions, Inc.	U.S. EPA	Remedial Investigation Report, Ottawa Radiation Areas NPL-8 Frontage Property	232
7	03/20/03	Weston Solutions, Inc.	U.S. EPA	Screening Level Risk Assessment Report, Ottawa Radiation Areas NPL-8 Frontage Property	153
8	05/14/03	Weston Solutions, Inc.	U.S. EPA	Engineering Evaluation/ Cost Analysis, NPL-11 Site, Ottawa, Illinois	140
9	07/10/03	Weston Solutions, Inc.	U.S. EPA	Generic Feasibility Study Report, Generic Site - Ottawa Radiation Areas, Ottawa, Illinois	384

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
10	07/10/03	Weston Solutions, Inc.	U.S. EPA	Technical Memorandum: Feasibility Study Supplement for the NPL-8 Frontage Property Ottawa Radiation Areas, Ottawa, Illinois	106
11	07/10/03	Boone, D. U.S. EPA	Mehl, R., Weston Solutions, Inc.	Letter re: U.S. EPA's Approval of the Engineering Evaluation/Cost Analysis for the NPL-11 Site, Ottawa Radiation Areas	1
12	07/11/03	Boone, D. U.S. EPA	Mehl, R., Weston Solutions, Inc.	Letter re: U.S. EPA's Approval of the Ottawa Radiation Areas Generic Feasibility Study Report	1
13	07/11/03	Boone, D. U.S. EPA	Mehl, R., Weston Solutions, Inc.	Letter re: U.S. EPA's Approval of the Technical Memorandum Feasibility Study Supplement for the NPL-8 Frontage Property, Ottawa Radiation Areas	1

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
OTTAWA RADIATION AREAS SITE
OTTAWA, LA SALLE COUNTY, ILLINOIS

UPDATE #12
SEPTEMBER 23, 2003

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	08/22/97	Luftig, S., & L. Weinstock, U.S. EPA	Addressees	Memorandum: Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination w/ Attachments	20
2	02/12/98	Luftig, S., & L. Weinstock, U.S. EPA	Addressees	Memorandum: Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites	6
3	04/11/00	Luftig, S., & S. Page, U.S. EPA	Addressees	Memorandum: Remediation Goals for Radioactively Contaminated CERCLA Sites Using a Benchmark Dose Cleanup Criteria in 10 CFR Part 40 Appendix A, 1, Criterion 6(6)	9
4	07/00/03	U.S. EPA	Public	Fact Sheet: EPA Proposes Cleanup Plan for 2 Areas and Future Situations at Ottawa Radiation Areas Site	8
5	07/30/03	U.S. EPA	Public	News Release: Public Meeting to Discuss Proposed Cleanup Plan for Radioactive Soil at the Ottawa Radiation Areas Site	1
6	07/30/03	Kelly A. Siska Reporting	U.S. EPA	Transcript of July 30, 2003 Public Meeting on the Proposed Plan for the Ottawa Radiation Areas Site	56
7	08/18/03	Swift, L., Northside Neighbor Watch Program	U.S. EPA	Public Comment Sheet: Comments on the Proposed Plan for the Ottawa Radiation Areas Site	1
8	08/27/03	Weston Solutions, Inc.	U.S. EPA	Technical Memorandum: Supplemental Radionuclide Risk Assessment Using RESRAD Report for the Ottawa Radiation Areas Site	75

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
9	09/02/03	Boone, D., U.S. EPA	Wallace, E., Office of Illinois Attorney General	Letter re: Draft Record of Decision and Supplemental Technical Memorandum for the Ottawa Radiation Areas Site	1